605
v. 3

IRON AND STEEL ENGINEER

J. F. KELLY, Editor

CONTENTS

Volume III January, 1926 Number I

Coming Meetings and Papers II

Board of Directors and National Committees for 1926 III

District Executive Committees VI

Editorial VII

Electricity's Contribution to the Iron and Steel Industry 1
(Main Roll Drives in the United States and Canada)

Electrical, Mechanical, Combustion and Safety Developments in the Iron and Steel Industry during the year 1925 31

Iron and Steel Exposition 82

(List of Advertisers VIII)

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Tech 50

COMING MEETINGS AND PAPERS

PITTSBURGH SECTION

TOPICAL DISCUSSION

"MANIPULATORS FOR REVERSING BLOOMING MILLS"

By

Mesta Machine Company,
United Engineering & Foundry Company,
Mackintosh Hemphill Company.

2:30 P. M., Saturday, February 27th, 1926

Blue Room, Wm. Penn Hotel, Pittsburgh, Pa.

PHILADELPHIA SECTION

"PURCHASED POWER RATES"

By D. M. Petty, Supt. Elec. Dept., Bethlehem Steel Company, Lehigh Plant, Bethlehem, Pa.

"UTILITY POWER RATES AND AN ANALYSIS OF RATE STRUCTURE"

By R. L. Baker, Manager Industrial Power Service, Metropolitan Edison Company, Reading, Pa.

7:30 P. M., Saturday, February 6th, 1926

Engineers' Club, 1317 Spruce Street, Philadelphia, Pa.

Informal Dinner at 6:30 P. M.

BIRMINGHAM SECTION

"RECENT POWER HOUSE DESIGN"

By F. G. Cutler, Chief, Bureau Steam Engineering, Tennessee Coal, Iron & R. R. Co., Ensley, Ala.

and

A. L. Freret, Elec. Engr., Tennessee Coal, Iron & R. R. Company, Birmingham, Ala.

8:00 P. M., Saturday, February 13th, 1926

Alabama Power Building, Birmingham, Ala.

CHICAGO SECTION

"CONTROL"

By C. J. Smith, Asst. Elec. Engr., Illinois Steel Company, So. Chicago, Ill.

8:00 P. M., Wednesday, January 27th, 1926

Electric Club, 30 No. Dearborn St., Chicago, Ill.

Informal dinner at 6:30 P. M.

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EDITORIAL

To the Executives,
Iron and Steel Industry,
United States and Canada.

Gentlemen:

For a number of years members of the Association of Iron and Steel Electrical Engineers have been convinced of the desirability of securing motors of uniform mounting dimensions for use in the steel industry so that the interchangeability of complete motors, regardless of from whom purchased, would be possible. Such standardization is an essential feature to reduction of the steel mill electrical inventory account.

Our previous efforts to standardize have been opposed by the electrical manufacturers on the grounds that they did not contemplate bringing out any new designs of motors and that it would not be possible to make any changes in the existing designs except at great hardship to themselves and probably without accomplishing the result the steel mill electrical engineers desire to attain. Probably their opposition was justified.

However, it is now generally understood that the electrical manufacturers are about to redesign their mill type line of motors, and therefore the time is ripe for the electrical engineers of the steel industry to take a very definite stand in this matter and insist that the electrical manufacturers co-operate in selecting such external dimensions as to secure interchangeability of motors of a given rated capacity.

We, therefore, are writing you hoping you will express your approval of this activity and give us your moral support.

In order that there may be no misunderstanding as to just what features we are asking the manufacturers to standardize we list them as follows:

(1) Horse power ratings and speeds.
(2) Armature bearings. (If anti-friction bearings are used.)
(3) Maximum external dimensions.
(4) Mounting bolt hole dimensions.
(5) Shaft diameters.
(6) Shaft tapers, keys and keyways.

In other words, produce a motor which is interchangeable with any other manufacturer's product of the same rated capacity.

We recently held, at the Duquesne Works of the Carnegie Steel Co., a meeting of forty representative steel mill electrical engineers at which this matter was fully discussed. At the conclusion of the meeting a motion was unanimously passed asking that the project be pushed with all possible speed.

In case the question might arise in your mind as to whether such a program might handicap design engineers in future development in the art of motor construction, I would suggest that the limitations such standardization would impose on the designer would be no greater than that imposed in the design of street railway motors, by the limited space available on street railway cars. Great progress has been made in the development of street car motors notwithstanding this limitation.

The "Association" will very greatly appreciate your approval of this movement.

Very truly yours,

A. C. CUMMINS,

Retiring President.

INDEX TO ADVERTISERS

A

Alliance Machine Company 118
Allis Chalmers Mfg. Company 93
American Heat Economy Bureau 125
Appleton Electric Company 115

B

Baker R & L Company 121
Benjamin Electric Mfg. Company 113
Bussmann Manufacturing Company 130

C

Chicago Fuse Mfg. Company 104
Clark Controller Company 101
Cleveland Crane & Engineering Company 95
Condit Electrical Mfg. Company 105
Corliss Carbon Company 111
Crocker Wheeler Electric Mfg. Co. 116
Crouse Hinds Company 98
Cutler Hammer Mfg. Co. ..... 109—Cover 1
Cutter Electrical & Mfg. Co. ..... 96—Cover 3

D

De Laval Steam Turbine Company 100
Delta Star Electric Company 123
M. H. Detrick Company 108
John C. Dolph Company 107
Doubleday Hill Electric Company 119
Duquesne Light Company 138

E

Economy Fuse & Mfg. Company 134
Electric Controller & Mfg. Co. 135

F

Farrel Foundry & Machine Company 103
Fawcus Machine Company 122

G

General Electric Company ..... Cover 4
Graybar Electric Co., Inc. 83, 84, 85, 86

H

Harnischfeger Corporation 133
Hyatt Roller Bearing Company 137

I

Iron City Electric Company 114

J

W. J. Jeandron 102
Johns Manville, Inc. 106
Johns Pratt Company 127

K

Keystone Lubricating Company 110

L

George T. Ladd Company 99
Le Carbone Brush Company 102

M

Martindale Electric Company 117
McConway & Torley Company 97
Moloney Electric Company 123
Monitor Controller Company 132
Morgan Construction Company 115
Morgan Engineering Company 88
Morganite Brush Company 114

N

National Carbon Company 87
Nichols Lintern Company ..... 104 A and B
Norma Hoffmann Bearing Corp. 126
R. D. Nuttall Company 128

O

Ohio Electric & Controller Company 92

P

Packard Electric Company 140
Pittsburgh Transformer Company 118

R

Reliance Electric & Engrg. Company 139
Roller Smith Company 117
Rumsey Electric Company 119

S

Shepard Electric Crane & Hoist Co. 129
SKF Industries, Inc. 112
Smith & Serrell 124
Stackpole Carbon Company 131
Standard Underground Cable Company 121

T

Thompson Electric Company 116
Timken Roller Bearing Company 94
Tool Steel Gear & Pinion Company 120
Trumbull Electric Mfg. Company 120

U

United States Graphite Company 122

V

V. V. Fittings Company 136

W

Westinghouse Elec. & Mfg. Co.—89, 90, 91—Cov. 2

Electricity's Contribution To The Iron & Steel Industry

Main Roll Drives in the United States and Canada

With this issue of the Iron and Steel Engineer we are publishing for the first time a tabulated list of main roll drives installed in the Iron and Steel Industry.

In the past this information has been published in cataloged forms by the different manufacturing companies, each catalog including only those installations involving their own equipment. It has always been difficult for the electrical engineer in the steel industry to properly analyze the information included in these various publications because of the wide differences in the method of tabulation used by the various manufacturers.

In this tabulation the Iron and Steel Engineer is presenting the information in a uniform manner showing the Horse Power, R.P.M., Voltage, Cycles, Type and Size of mill, Method of drive, date of purchase, name of plant and location. Also a classified list which gives the types of installations in Blooming Mills, Plate Mills, Rail and Structural Mills, Bar and Billet Mills, Sheet Bar and Skelp Mills, Sheet & Tin Plate Plants, Rod Mills, Piercing Mills, Tube Mills, Strip and Hoop Mills, Merchant Mills, Wire Mills, Wheel Mills, Aluminum, Brass, Copper and Non-Ferrous Mills, also the Multi-Speed Drives, A.C. Speed sets, Direct Current Adjustable Speed Drives and Reversing Blooming Mill Drives are tabulated.

This data has been prepared with the view of providing the Executives, and engineers in the Iron and Steel Industry an authority, and a reference manual for their guidance in future installations and extensions.

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300-300	187.5-112.5	2200	25	12" Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
2	300-300	187.5-112 5	2200	25	12" Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
3	300	225-300	230	d.c.	Merchant (Finishing) Mil	Direct	1916	Pacific Coast Steel Co.	Seattle, Wash.	W
4	300	250	440	25	Sheet Mill	Geared	1910	Simonds Mfg. Co.	Lockport, N. Y.	GE
5	300	250	440	25	Cogging Mill	Geared	1910	Simonds Mfg. Co.	Lockport, N .Y.	GE
6	300	257	2200	60	Roll		1917	Tennessee Coal, Iron & R. R. Co.	Bessemer, Ala.	CW
7	300	290	2200	25	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
8	300	290	2200	25	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
9	300	290	2200	25	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
10	300	290	2200	25	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
11	300	300	230	d.c.	Cold Rolling Mill	Geared	1914	Trumbull Steel Co.	Warren, Ohio	W
12	300-300	300-180	2200	25	10" Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
13	300	300	2200	60	Piercing Mill	Coupled	1918	Pittsburgh Steel Products Co.	Allenport, Pa.	CW
14	300	300-600	230	d.c.	20" x 30" Brass Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
15	300	300-600	230	d.c.	20" x 30" Brass Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
16	300	200-600	230	d.c.	22" x 36" Brass Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
17	300	300-600	230	d.c.	22" x 36" Brass Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
18	300	300	230	d.c.	Cold Rolling Mill	Geared	1920	Alan Wood Iron & Steel Co.	Conshohocken, Pa.	W
19	300	300	2200	60	26" Cold Mill	Coupled		International Nickel Co.	Huntington, W. Va.	AC
20	300	300	2200	60	Piercing Mill	Coupled	1917	Pittsburgh Steel Products Co.	Monessen, Pa.	CW
21	300	300	2200	60	Roll		1917	Tennessee Coal, Iron & R. R. Co.	Bessemer, Ala.	CW
22	300	300	230	d.c.	Steel Mill	Geared	1925	National Tube Co.	Lorain, Ohio	AC
23	300	300	230	d.c.	Steel Mill	Geared	1925	National Tube Co.	Lorain, Ohio	AC
24	300	300	230	d.c.	Steel Mill	Geared	1925	National Tube Co.	Lorain, Ohio	AC
25	300-300	315-630	230	d.c.	8" Merchant Mill	Direct	1919	Donner Steel Co.	Buffalo, N. Y.	GE
26	300	325-650	220	d.c.				Aluminum Co. of America	New Kensington, Pa.	AC
27	300-225-165	335-225-165	6600	25	12" Hot Strip Mill	Geared	1920	Illinois Steel Co.	Gary, Ind.	GE
28	300	340	2200	60	Cold Rolling Mill	Geared	1921	Newton Steel Co.	Newton Falls, Ohio	W
29	300	345-500	500	d.c.	Tube Rolling Mill	Geared	1912	Pittsburgh Steel Prod. Co.	Monessen, Pa.	W
30	300	350	2200	60	Seamless Tube Mill	Geared	1915	Timken Roller Bearing Co.	Canton, Ohio	W
31	300	350	2200	60	Cold Rolling Mill	Geared	1915	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	W
32	300	350	2200	60	Tube Rolling Mill	Geared	1919	Timken Roller Bearing Co.	Canton, Ohio	W
33	300	350-450	230	d.c.	Lap Welding Mill	Coupled		Gary Tube Co.	Gary, Ind.	AC
34	300	350-500	230	d.c.	Merchant Mill	Coupled	1915	Buffalo Bolt Co.	N. Tonawanda, N. Y.	CW
35	300	352	2200	60	Cold Roll Mill	Direct	1923	Sharon Steel Hoop Co.	Youngstown, Ohio	W
36	300	353	2200	60	Cold Rolls	Geared		Reeves Mfg. Co.	Dover, Ohio	AC
37	300	360	2200	60	Sheet Mill—Cold Rolls	Geared	1922	U. Alloy Steel Corp., Berger Div.	Canton, Ohio	GE
38	300	360	2300	60	Cold Rolls	Geared	1923	Mansfield Sheet & Tin Plate Co.	Ashtabula, Ohio	GE
39	300	360	2200	60	10" Strip Mill	Coupled	1923	Pittsburgh Steel Co	Glassport, Pa.	CW
40	300	363	220	25	Cold Rolling Mill	Geared	1920	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
41	300	365	2200	25	8" Merchant Mill	Direct	1909	Bethlehem Steel Co.	Johnstown, Pa.	W
42	300	375	2200	25	Wire Mill	Geared	1910	Bethelhem Steel Co.	Johnstown, Pa.	GE
43	300	375	2200	25	Wire Mill	Geared	1910	Bethlehem Steel Co.	Johnstown, Pa.	GE
44	300	375	2200	25	Wire Mill	Geared	1910	Bethlehem Steel Co.	Johnstown, Pa.	GE
45	300	375	2200	25	Wire Mill	Geared	1910	Bethlehem Steel Co.	Johnstown, Pa.	GE
46	300	375	2200	25	Wire Mill	Belt	1915	American Steel & Wire Co.	Cleveland, Ohio	GE
47	300	375	2200	25	Wire Mill	Belt	1915	American Steel & Wire Co.	Cleveland, Ohio	GE
48	300	375	2200	25	Wire Mill	Belt	1915	American Steel & Wire Co.	Cleveland, Ohio	GE
49	300	375	2200	25	Wire Mill	Belt	1915	American Steel & Wire Co.	Cleveland, Ohio	GE
50	300	375	2200	25	Wire Mill	Belt	1915	American Steel & Wire Co.	Cleve and, Ohio	GE
51	300	375	2200	25	10" Bar Mill	Geared	1919	Hammond Steel Co.	Solvay, N. Y.	GE
52	300	375	2200	25		Rope		Bethlehem Steel Co.	Johnstown, Pa.	AC
53	300	375	2200	25		Rope		Bethlehem Steel Co.	Johnstown, Pa.	AC
54	300	375	2200	25	Bar Mill	Coupled		Bethlehem Steel Co.	Johnstown, Pa.	AC
55	300	400	550	40	10" Bar Mill	Geared	1909	Ludlum Steel Co.	Watervliet, N. Y.	GE
56	300-300	400-800	230	d.c.	Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
57	300-300	400-800	230	d.c.	Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
58	300-300	400-800	230	d.c.	Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
59	300-300	400-800	230	d.c.	Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
60	300-300	400-800	230	d.c.	20" x 24" Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE
61	300-300	400-800	230	d.c.	20" x 24" Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE
62	300-300	400-800	230	d.c.	20" x 24" Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE
63	300-300	400-800	230	d.c.	20" x 24" Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
64	300	435	2200	60	18" Copper Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
65	300	435	2200	60	24" x 48" Copper Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
66	300	435	230	d.c.	12" Pipe Mill	Coupled	1910	A. M. Byers Co.	Pittsburgh, Pa.	CW
67	300	435	230	d.c.	12" Pipe Mill	Coupled	1910	A. M. Byers Co.	Pittsburgh, Pa.	CW
68	300	440	2200	60	Roughing Mill	Coupled		Ft. Wayne Rolling Mill Co.	Ft. Wayne, Ind.	AC
69	300	440	2200	60	Cold Roll Mill	Geared	1924	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
70	300	440	2200	60	Cold Roll Mill	Geared	1924	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
71	300	450	440	60	Wire Mill	Geared	1914	American Steel & Wire Co.	Joliet, Ill.	AC
72	300	450	440	60	Wire Mill		1914	American Steel & Wire Co.	Joliet, Ill.	AC
73	300	450-750	230	d.c.	Wheel Mill	Geared	1913	Bethlehem Steel Co.	Johnstown, Pa.	AC
74	300	450-750	230	d.c.	Wheel Mill	Geared	1913	Bethlehem Steel Co.	Johnstown, Pa.	AC
75	300	450	230	d.c.	Merchant Bar Mill	Geared	1916	Carbon Steel Co.	Pittsburgh, Pa.	W
76	300	450	2200	60	8" Merchant Mill		1917	Llewellyn Iron Works	Los Angeles, Cal.	GE
77	300	450	550	60	Bar Mill	Coupled	1921	National Conduit & Cable Co.	Hast. on Hudson,N.Y	AC
78	300	450	220	30	Lap Welding Rolls	Geared	1923	Spang Chalfant Co.	Etna, Pa.	GE
79	300	450	2200	60	Cross Rolls in Tube Mill	Geared	1924	Standard Seamless Tube Co.	Economy, Pa.	GE
80	300	450	2200	60	Cross Rolls in Tube Mill	Geared	1924	Standard Seamless Tube Co.	Economy, Pa.	GE
81	300	485	2200	25	Cold Rolling Mill	Direct	1916	Halcomb Steel Co.	Syracuse, N. Y.	W
82	300-300	500-300	2200	25	9" Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
83	300-300	500-300	2200	25	8" Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
84	300	500	220	25		Geared	1915	Republic Iron & Steel Co.	Youngstown, Ohio	GE
85	300	500	2080	25	9" Merchant Mill	Geared	1916	Halcomb Steel Co.	Syracuse, N. Y.	GE
86	300	500	550	25	Tube Mill	Geared	1917	Baltimore Tube Co.	Baltimore, Md.	W
87	300	500	230	d.c.	Welding Rolls, pipe mill	Geared	1925	Central Tube Co.	Economy, Pa.	GE
88	300	500	550	25	Tube Mill	Geared	1917	Baltimore Tube Co.	Baltimore, Md.	W
89	300	500	220	25		Geared	1917	Republic Iron & Steel Co.	Youngstown, Ohio	GE
90	300	500		60	Brass Mill	Coupled	1917	British American Metals Co.	Plainfield, N. J.	CW
91	300	514	440	60	Tube Mill	Geared	1914	Detroit Seamless Tube Co.	Detroit, Mich.	GE
92	300	514	220	60	Tube Mill	Geared	1914	Detroit Seamless Tube Co.	Detroit, Mich.	GE
93	300	514	440	60	Brass Mill	Geared	1915	Chase Metal Works	Waterbury, Conn.	GE
94	300	514	2200	60	Bar Mill	Geared	1915	C. G. Hussey	Pittsburgh, Pa.	AC
95	300	514	220	60	Tube Mill	Geared	1918	Detroit Seamless Tube Co.	Detroit, Mich.	AC
96	300	514	550	60	Brass Sheet Mill	Geared	1919	National Conduit & Cable Co.	Hastings, N. Y.	GE
97	300	514	550	60	14" Cold Strip Mill	Geared	1922	Wallingford Steel Co.	Wallingford, Conn.	GE
98	300	575	2200	60	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
99	300	575	2200	60	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
100	300	575	2200	60	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
101	300	575	2200	60	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
102	300	575	2200	60	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
103	300	575	2200	60	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
104	300	575	2200	60	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
105	300	575	2200	60	Cold Rolling Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
106	300	575	2200	60	Cold Rolling Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
107	300	575	2200	60	Cold Rolling Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
108	300	575	2200	60	Cold Rolling Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
109	300	575	2200	60	Rod Mill	Geared	1922	Standard Underground Cable Co.	Perth Amboy, N. J.	W
110	300	585	440	50	18" Copper Mill	Chain	1916	Standard Underground Cable Co.	Perth Amboy, N. J.	W
111	300-150	590-292	2200	60	9" Merchant (Fin.) Mill	Geared	1920	Cleveland Hardware Co.	Cleveland, Ohio	W
112	300	600	2200	60	Brass Mill	Geared	1915	Chase Metal Works	Waterbury, Conn.	GE
113	300	600	2200	60			1915	Cleveland Brass & Copper Co.	Cleveland, Ohio	AC
114	300	600	2200	60			1915	Cleveland Brass & Copper Co.	Cleveland, Ohio	AC
115	300-300-150	600-400-300	440	60	Bar Mill	Chain	1916	Vulcan Crucible Steel Co.	Aliquippa, Pa.	GE
116	300	600	2300	60	12" Billet Mill	Geared	1916	Tennessee Coal, Iron & R. R. Co.	Bessemer, Ala.	GE
117	300	600	2200	60	Merchant Mill	Geared	1916	Tennessee Coal, Iron & R. R. Co.	Bessemer, Ala.	GE
118	300	600	2300	60	Wire Mill	Geared	1917	American Steel & Wire Co.	Waukegan, Ill.	GE
119	300	600	440	60	Brass Mill	Geared	1919	Bristol Brass Co.	Bristol, Conn.	GE
120	300	600	2200	60	10" Hot Strip Mill	Direct	1919	Superior Steel Co.	Carnegie, Pa.	GE
121	300	600	440	60	Brass Mill		1920	Detroit Copper & Brass Co.	Detroit, Mich.	AC
122	300	600	440	60			1920	Detroit Copper & Brass Co.	Detroit, Mich.	AC
123	300	600	440	60			1920	Detroit Copper & Brass Co.	Detroit, Mich.	AC
124	300	600	2200	60	Tube Mill	Geared	1922	Weldless Tube Co.	Wooster, Ohio	GE
125	300	600	2200	60	Tube Mill	Geared	1922	Weldless Tube Co.	Wooster, Ohio	GE
126	300	600	2200	60	Cold Sheet Mill Rolls	Geared	1923	Falcon Steel Co.	Niles, Ohio	GE
127	300	600	550	60		Geared		National Conduit & Cable Co.	Hast. on Hudson,N.Y	AC
128	300	600	550	60		Geared		National Conduit & Cable Co.	Hast. on Hudson,N.Y	AC
129	300	600	440	60	Copper Strip Mill	Geared	1925	Detroit Copper & Brass Co.	Detroit, Mich.	CW
130	300	720	440	60	14" Merchant Mill	Geared	1913	Union Rolling Mills Co.	Cleveland, Ohio	GE
131	300	720	2200	60	Wire Rod Mill	Geared	1917	Rome Wire Co.	Rome, N. Y.	AC
132	300	720	440	60	12" Merchant Mill	Geared	1919	The Stanley Works	New Britain, Conn.	GE
133	300	720	440	60	Bar Mill	Geared	1920	Hoskins Mfg. Co.	Detroit, Mich.	AC
134	300	750	3000	50	Merchant Mill	Geared	1923	Cons. Rolling Mills Co.	Mexico City, Mex.	GE
135	300	750	2200	25	10" Bar Mill	Geared	1923	Bethlehem Steel Co.	Lebanon, Pa.	GE
136	300-200	920-360	220	d.c.	Merchant Mill	Direct	1919	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
137	325	360	2200	50	Bar Mill	Geared	1915	Heppenstall Forge & Knife Co.	Pittsburgh, Pa.	GE
138	325	600	2300	50	Wire Mill	Geared	1917	American Steel & Wire Co.	Waukegan, Ill.	GE
139	340	85	230	d.c.	Welding Rolls	Coupled	1906	National Tube Co.	McKeesport, Pa.	CW
140	350	125	6600	25	12" Bar Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
141	350	145	2200	60	Cold Rolling Mill	Rope	1912	Central Steel Co.	Massillon, Ohio	W
142	350-350	150-100	6600	25	12" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
143	350	200-300	250	d.c.	9" Merchant Mill	Direct	1919	National Farming Mach. Co., Ltd.	Montmagny, P. Q.	W
144	350-350	240-480	240	d.c.	10" Merchant Mill	Direct	1923	LaClede Steel Co.	St. Louis, Mo.	GE
145	350	242	2200	25	Cold Strip Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	W
146	350	250	2200	25	10" Rod Mill	Direct	1911	Dillworth Porter Co.	Pittsburgh, Pa.	GE
147	350	250	440	25	Brass Mill	Geared	1921	Harrison Radiator Corp.	Lockport, N. Y.	GE
148	350	250-325	230	d.c.	9" Merchant Mill	Direct	1921	Wayne Steel Co.	Erie, Pa.	W
149	350-350	275-470	375	d.c.	Reversing Copper Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	GE
150	350-350	275-470	375	d.c.	Reversing Copper Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	GE
151	350-350	275-470	375	d.c.	Reversing Copper Mill	Geared	1920	American Brass Co.	Kenosha, Wis.	GE
152	350-350	275-470	375	d.c.	Reversing Copper Mill	Geared	1922	Taunton-New Bedford Copper Co.	Taunton, Mass.	GE
153	350-235	300-200	6600	25	Merchant Mill	Geared	1920	Illinois Steel Co.	Gary, Ind.	GE
154	350	300	230	d.c.	Wire Draw Bench	Coupled	1908	Pittsburgh Steel Co.	Monessen, Pa.	CW
155	350	300	230	d.c.	Wire Draw Bench	Coupled	1908	Pittsburgh Steel Co.	Monessen, Pa.	CW
156	350	300	230	d.c.	Wire Draw Bench	Coupled	1908	Pittsburgh Steel Co.	Monessen, Pa.	CW
157	350	300	230	d.c.	Wire Draw Bench	Coupled	1911	Pittsburgh Steel Co.	Monessen, Pa.	CW
158	350	345	440	60	Sheet Mill	Geared	1917	Universal Steel Co.	Bridgeville, Pa.	W
159	350	320	2200	60	21" Plate (Cold Roll.) Mill	Geared	1910	Oliver Iron & Steel Co.	Wilson Station, Pa.	W
160	350-350	360-240	240	d.c.	10" Merchant Mill	Direct	1911	LaClede Steel Co.	St. Louis, Mo.	GE
161	350	360	2200	60	Sheet Mill—Cold Rolls	Geared	1919	Falcon Steel Co.	Niles, Ohio	GE
162	350-350	360-450	230	d.c.	Welding Rolls	Direct	1920	National Tube Co.	Lorain, Ohio	GE
163	350-350	360-450	230	d.c.	Welding Rolls	Direct	1920	National Tube Co.	Lorain, Ohio	GE
164	350-350	360-240	440	60	Bar Mill	Coupled	1921	Simmons Mfg. Co.	Kenosha, Wis.	AC
165	350-350	375-214	6600	25	9" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
166	350	400	2200	60	Wire Rod Mill	Geared	1918	Taunton-New Bedford Copper Co.	New Bedford, Mass.	AC
167	350	400	2200	60	Wire Rod Mill	Coupled	1918	Taunton-New Bedford Copper Co.	New Bedford, Mass.	AC
168	350	400	2200	60	Wire Rod Mill	Coupled	1918	Taunton-New Bedford Copper Co.	New Bedford, Mass.	AC
169	350	400-600	230	d.c.	Hot Mill	Geared	1913	Bethlehem Steel Co.	Lackawanna, N. Y.	CW
170	350	420	2200	50	Merchant Mill	Geared	1919	Southern California Iron & Steel Co.	Los Angeles, Cal.	W
171	350	435	2200	60	Pipe Welding Rolls	Geared	1919	Wheeling Steel Corporation	Steubenville, Ohio	W
172	350	480	2200	25	12" Roughing Mill	Geared	1923	Halcomb Steel Co.	Syracuse, N. Y.	W
173	350	490	6400	25	24" Flat Edging Mill	Geared	1916	American Steel & Wire Co.	Cleveland, Ohio	W
174	350	490	2200	25	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
175	350	490	2200	25	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
176	350	500	230	d.c.	16" Cont. Skelp Mill	Geared	1924	Gary Tube Co.	Gary, Ind.	AC
177	350	524-850	230	d.c.	18" Blading Mill	Geared	1924	W. E. & M. Co.	South Phila. Works	W
178	350	580	2200	60	Merchant Mill	Geared	1916	Copper Clad Steel Co.	Pittsburgh, Pa.	W
179	350	590	2200	60	12" Merchant Mill	Geared	1918	Indianapolis & Eastern TractionCo.	Indianapolis, Ind.	W
180	350	600	2200	60	Bar Mill	Belted	1920	Joslyn Mfg. Co.	Chicago, Ill.	AC
181	350	700	2200	60	Merchant Mill	Geared	1918	Kilby Car & Foundry Co.	Anniston, Ala.	W
182	360	300-425	230	d.c.	8" Rod Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
183	360	300-600	230	d.c.	Rod Mill	Direct	1922	United Alloy Steel Corporation	Canton, Ohio	W
184	360	350-500	230	d.c.	7" Rod Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
185	375	430-860	230	d.c.	20" Cold Rolling Mill	Geared	1922	Otis Steel Company	Cleveland, Ohio	W
186	375	430-860	230	d.c.	20" Cold Rolling Mill	Geared	1922	Otis Steel Company	Cleveland, Ohio	W
187	375	430-860	230	d.c.	20" Cold Rolling Mill	Geared	1922	Otis Steel Company	Cleveland, Ohio	W
188	375	430-860	230	d.c.	20" Cold Rolling Mill	Geared	1922	Otis Steel Company	Cleveland, Ohio	W
189	375	430-860	230	d.c.	20" Cold Rolling Mill	Geared	1922	Otis Steel Company	Cleveland, Ohio	W
190	375	430-860	230	d.c.	Cold Roll Mill	Geared	1925	Otis Steel Co.	Cleveland, Ohio	GE
191	375	430-860	230	d.c.	Cold Roll Mill	Geared	1925	Otis Steel Co.	Cleveland, Ohio	GE
192	400	20		d.c.	32" x 48" Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Indiana	CW
193	400	20		d.c.	32" x 48" Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Indiana	CW
194	400	20		d.c.	32" x 48" Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Indiana	CW
195	400	20		d.c.	32" x 48" Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Indiana	CW
196	400	75		d.c.	Welding Rolls	Coupled	1906	National Tube Co.	McKeesport, Pa.	CW
197	400-400	107- 64	2200	25	16" Bar Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
198	400	125	230	d.c.	12" Structural Mill	Direct	1919	Eastern Steel Co.	Pottsville, Pa.	W
199	400	200-300	230	d.c.	9" Merchant Mill	Direct	1914	United Alloy Steel Corporation	Canton, Ohio	W
200	400	210-350		d.c.	Merchant Mill		1915	Buffalo Bolt Co.	No. Tonawanda, N. Y	CW
201	400-400	250-500	230	d.c.	10" Merchant Mill	Direct	1920	Timken Roller Bearing Co.	Canton, Ohio	GE
202	400-400	275-500	550	d.c.	12" Hot Strip Mill	Direct	1916	American Steel & Wire Co.	Cleveland, Ohio	GE
203	400	290	2200	60	Cold Rolling Mill	Geared	1916	Youngstown Sheet & Tube Co.	Warren, Ohio	W
204	400	290	2200	60	Cold Rolling Mill	Geared	1917	Liberty Steel Co.	Warren, Ohio	W
205	400	300	2200	25	Merchant Mill	Rope	1909	American Steel & Wire Co.	Cleveland, Ohio	GE
206	400	300	2200	25	Merchant Mill	Rope	1909	American Steel & Wire Co.	Cleveland, Ohio	GE
207	400	300	2200	25	Merchant Mill	Rope	1909	American Steel & Wire Co.	Cleveland, Ohio	GE
208	400	300	2200	25	Merchant Mill	Rope	1909	American Steel & Wire Co.	Cleveland, Ohio	GE
209	400	300	2200	25		Geared	1918	Pittsburgh Steel Co.	Monessen, Pa.	AC
210	400	300	440	60			1918	Withrow Steel Co.	Neville Island, Pa.	AC
211	400-500	300-600	600	d.c.	9" Merchant Fin. Mill	Geared	1921	Driver Harris Co.	Harrison, N. J.	W
212	400	350	440	60	9" Copper Finishing Mill	Direct	1916	Standard Underground Cable Co.	Perth Amboy, N. J.	W
213	400	352	2200	60	Copper Rod Mill	Geared	1923	American Brass Company	Kenosha, Wis.	W
214	400	360	2200	60	Sheet Mill, Cold Rolls	Geared	1916	Mahoning Valley Steel Co.	Niles, Ohio	GE
215	400	360	2200	60	Sheet Mill, Cold Rolls	Geared	1916	Mahoning Valley Steel Co.	Niles, Ohio	GE
216	400	360	2200	60	Brass Mill	Geared	1917	American Brass Co.	Waterbury, Conn.	GE
217	400	360	2200	60	Brass Mill	Geared	1917	American Brass Co.	Waterbury, Conn.	GE
218	400	360	2200	60	Cold Roll Sheet Mill	Geared	1918	Reeves Mfg. Co.	Canal Dover, Ohio	GE
219	400	360	2200	60	Brass Mill	Geared	1921	American Brass Co.	Torrington, Conn.	GE
220	400	360	2200	60	Brass Mill	Geared	1921	American Brass Co.	Torrington, Conn.	GE
221	400	360	440	60	Cold Strip Mill	Geared	1921	American Tube and Stamping Co.	Bridgeport, Conn.	GE
222	400	360	440	60			1921	Detroit Copper & Brass Co.	Detroit, Mich.	AC
223	400	360	2200	60	8" Strip Mill	Coupled	1923	Pittsburgh Steel Co.	Glassport, Pa.	CW
224	400	360	2300	60	Sheet Mill, Cold Rolls	Geared	1925	Thomas Sheet Steel Co.	Niles, Ohio	GE
225	400	375	220	25	20" Tube Mill, Wld. Rolls	Geared	1909	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
226	400	375	220	25	Tube Mill, Chill Rolls	Geared	1909	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
227	400	375	2200	25	Wire Drawing Bench	Rope	1915	American Steel & Wire Co.	Cleveland, Ohio	GE
228	400	375	2200	25	Wire Drawing Bench	Rope	1915	American Steel & Wire Co.	Cleveland, Ohio	GE
229	400	375	220	25	Tube Mill, Wld. Rolls	Geared	1917	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
230	400	375	220	25	Tube Mill, Wld. Rolls	Geared	1912	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
231	400	375	220	25	Tube Mill, Wld. Rolls	Geared	1922	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
232	400	385	550	40	22" Puddle Mill	Geared	1917	Cohoes Rolling Mill Co.	Cohoes, N. Y.	W
233	400	400-450	220	d.c.	8" Merchant Mill	Direct	1911	Illinois Steel Co.	Milwaukee, Wis.	W
234	400	400	400	60	Bar Mill	Chain	1918	Latrobe Steel Co.	Latrobe, Pa.	AC
235	400	400	440	60	Lap Welding Rolls	Geared	1923	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
236	400	400	440	60	Lap Welding Rolls	Geared	1923	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
237	400	435	2200	60	Aluminum Mill	Geared	1918	U. S. Aluminum Co.	New Kensington, Pa.	W
238	400	435	2200	60	Aluminum Mill	Geared	1918	U. S. Aluminum Co.	New Kensington, Pa.	W
239	400	435	440	60	Pipe Mill	Geared	1918	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
240	400	435	2200	60	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Edgewater, N. J.	W
241	400	440	2200	60	Copper Rod Mill	Geared	1922	American Brass Company	Kenosha, Wis	W
242	400	440	4000	60		Coupled	1923	Bryden Neverslip Co.	Catasauqua, Pa.	AC
243	400	450	2200	60	Brass Mill	Geared	1917	American Brass Co.	Waterbury, Conn.	GE
244	400	450	2200	60	Bar Mill		1917	Standard Seamless Tube Co.		AC
245	400	450	550	60		Geared	1918	Pressed Steel Car Co.	McKees Rocks, Pa.	AC
246	400	450	2200	60	Wire Drawing Bench	Geared	1919	Gulf States Steel Co.	Birmingham, Ala.	GE
247	400	450	2200	60	Wire Drawing Bench	Geared	1919	Gulf States Steel Co.	Birmingham, Ala.	GE
248	400	450	440	60	Brass Sheet Mill	Geared	1920	Detroit Copper & Brass Co.	Detroit, Mich.	GE
249	400	450	440	60			1921	Detroit Copper & Brass Co.	Detroit, Mich.	AC
250	400	450	440	60	Sheet Mill	Geared	1924	New Jersey Zinc Co.	Palmerton, Pa.	GE
251	400	450	440	60	Sheet Mill	Geared	1924	New Jersey Zinc Co.	Palmerton, Pa.	GE
252	400	450	2200	60	9" Bar Mill	Geared	1924	Atchison, Topeka & S. F. Ry. Co.		AC
253	400	450	2200	60	12" Bar Mill	Geared	1924	Atchison, Topeka & S. F. Ry. Co.		AC
254	400	485	440	25	9" Merchant Mill	Geared	1916	Hess Steel Corporation	Baltimore, Md.	W
255	400	514	2200	60			1913	Cleveland Brass & Copper Co.	Cleveland, Ohio	AC
256	400	514	2200	60	Brass Tubes	Geared	1915	American Brass Company	Waterbury, Conn.	GE
257	400	514	2200	60	Brass Tubes	Geared	1915	American Brass Company	Waterbury, Conn.	GE
258	400	514	2200	60	24" Roughing Mill	Geared	1915	American Brass Company	Kenosha, Wis.	AC
259	400	514	2200	60	20" Flat Mill	Geared	1915	American Brass Company	Kenosha, Wis.	AC
260	400	514	2200	60	18" Bar Mill	Geared	1915	American Brass Company	Kenosha, Wis.	AC
261	400	514	440	60	16" Copper Bar Mill	Geared	1916	Waclark Wire Co.	Elizabeth, N. J.	GE
262	400	514	2200	60	Bar Mill	Geared	1919	Judson Mfg. Co.	Oakland, Calif.	AC
263	400	514	2200	60	Brass Mill	Geared	1922	Western Cartridge Co.	East Alton, Ill.	GE
264	400	514	6600	60				Weirton Steel Co.	Weirton, W. Va.	AC
265	400	514	6600	60				Weirton Steel Co.	Weirton, W. Va.	AC
266	400	575	2200	60	Cold Rolling Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
267	400	575	2200	60	Cold Rolling Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
268	400	575	2200	60	Cold Rolling Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
269	400	575	2200	60	Cold Rolling Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
270	400	575	440	60	Sheet Cop. Rolling Mill	Geared	1923	American Metal Products Co.	Milwaukee, Wis.	W
271	400	585	4000	60	14" Merchant Mill	Geared	1922	Calumet Steel Co.	Chicago, Ill.	W
272	400-225	600-300	550	40	Bar Mill	Geared	1909	Ludlum Steel Co.	Watervliet, N. Y.	GE
273	400	600	440	60	Piercing Mill	Geared	1915	Chase Metal Works	Waterbury, Conn.	GE
274	400	600	440	60	Billet Piercing Machine	Geared	1915	Chase Metal Works	Waterbury, Conn.	GE
275	400	600	440	60	Brass Mill	Geared	1917	Rome Brass & Copper Co.	Rome, N. Y.	GE
276	400	600	2200	60	Wire Rod Mill	Geared	1917	Rome Wire Co.	Rome, N. Y.	AC
277	400	600	440	60	Wire Mill	Coupled	1917	Rome Wire Co.	Rome, N. Y.	AC
278	400	600	440	60	12" Merchant Mill	Geared	1919	The Stanley Works	New Britain, Conn.	GE
279	400	600	440	60	Tube Mill	Geared	1920	Globe Seamless Tube Co.	Milwaukee, Wis.	AC
280	400	600	2200	60	Brass Mill	Geared	1921	American Brass Company	Torrington, Conn.	GE
281	400	600	550	60		Geared	1921	National Conduit & Cable Co.	Hast.on Hudson,N.Y.	AC
282	400	600	2200	60	Zinc Mill	Geared	1922	Ball Brothers Glass Co.	Muncie, Ind.	GE
283	400	600	220	60		Coupled		Consumers Steel Co.	Chicago, Ill.	AC
284	400	600	2200	60	2-Roughing Stands—Brass Rolling Mills	Geared	1925	American Brass Co.	Torrington, Conn.	GE

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
285	400	705	2200	60	16" Cogging Mill	Geared	1923	Crucible Steel Co. of America Park Works	Pittsburgh, Pa.	W
286	400	720–450	2200	60	Bar Mill	Geared	1917	Cyclops Steel Co.	Titusville, Pa.	AC
287	400	720	2200	60	Copper Mill	Geared	1920	Rome Wire Co.	Rome, N. Y.	GE
288	400	720	550	60	Copper Mill	Geared	1920	Phillips Wire Co.	Pawtucket, R. I.	GE
289	400	750	4400	25	Rail Splitter	Geared	1925	Buffalo Steel Co.	Tonawanda, N. Y.	GE
290	400–200	800–400	230	d.c.	Copper Sheet Mill	Geared	1925	Rome Brass & Copper Co.	Rome, N. Y.	GE
291	400–265	875–585	2200	60	Bar Mill	Geared	1913	Old Dominion Iron & Nail Co.	Richmond, Va.	W
292	400	900	550	60	Brass Mill	Geared	1920	American Brass Company	Ansonia, Conn.	GE
293	400	900	550	60	Brass Mill	Geared	1920	American Brass Company	Ansonia, Conn.	GE
294	400	900	550	60	Brass Mill	Geared	1920	American Brass Company	Ansonia, Conn.	GE
295	400	900	550	60	Brass Mill	Geared	1920	American Brass Company	Ansonia, Conn.	GE
296	400	900	2200	60	Bar and Billet Mill	Geared	1925	Crucible Steel Co.	Pittsburgh, Pa.	W
297	400	900	550	60	Brass Mill	Geared	1921	American Brass Company	Ansonia, Conn.	GE
298	450	125	6600	25	12" Bar Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
299	450	200–400	230	d.c.	Zinc Sheet Mill, 26" x 72"	Geared	1924	Illinois Zinc Co.	Peru, Illinois	W
300	450	300	2200	60			1918	Pittsburgh Steel Prod. Co.	Monessen, Pa.	AC
301	450	300	2200	60			1918	Pittsburgh Steel Prod. Co.	Monessen, Pa.	AC
302	450	300	230	d.c.	10" Tube Mill	Coupled	1911	Pittsburgh Seamless Tube Co.	Beaver Falls, Pa.	CW
303	450	354–230	2200	60	8" Merchant Mill	Direct	1919	Bourne-Fuller Co.	Cleveland, Ohio	W
304	450	375	440	25	Cold Roll	Geared	1925	Seneca Iron & Steel Co.	Blasdell, N. Y.	CW
305	450	400–650	230	d.c.	Rod (1 Stand) No. 2 Mill	Direct	1913	American Stee & Wire Co.	Worcester, Mass.	W
306	450	440	2200	60	Merchant Mill	Geared	1920	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
307	450	440–350	2220	60	Cont. Hoop (Finishing)	Direct	1920	Conners Steel Co.	Birmingham, Ala.	W
308	450	450–600	230	d.c.	12" Cold Strip Mill	Geared	1915	Superior Steel Co.	Carnegie, Pa.	W
309	450	450–600	230	d.c.	12" Cold Strip Mill	Geared	1915	Superior Steel Co.	Carnegie, Pa.	W
310	450	450	2080	60	18" Merchant Mill	Geared	1919	Columbia Steel Co.	Pittsburgh, Cal.	GE
311	450	450	2080	60	12" Merchant Mill	Geared	1919	Columbia Steel Co.	Pittsburgh, Cal.	GE
312	450	500	440	60	Brass Rolling Mill	Geared	1918	Michigan Copper & Brass Co.	Detroit, Mich.	W
313	450	514	550	60	14" Cold Strip Mill	Geared	1922	Wallingford Steel Co.	Wallingford, Conn.	GE
314	450	550–750	230	d.c.	Zinc Rolls	Coupled	1924	Mattheisen & Hegeler Zinc Co.	LaSalle, Ill.	CW
315	450	550–750	230	d.c.	Zinc Strip Mills	Geared	1925	Mattheisen & Hegeler Zinc Co.	LaSalle, Ill.	CW
316	450	585	2200	50	14" Merchant Mill	Geared	1918	Columbia Steel Co.	Los Angeles, Cal.	W
317	450	600	550	60	Copper Rod Mill	Geared	1920	Phillips Wire Co.	Pawtucket, R. I.	GE
318	450	700–595	2200	60	Cont. Hoop (Finishing)	Direct	1921	Conners Steel Co.	Birmingham, Ala.	W
319	450	720	2200	60	Piercing Mill	Geared	1924	Standard Seamless Tube Co.	Economy, Pa.	GE
320	450	730–490	4000	25	10" Merchant Mill	Geared	1917	Atlas Steel Corporation	Dunkirk, N. Y.	W
321	450	730	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
322	450	730	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
323	450	870	440	60	Copper Clad Mill	Geared	1915	Duplex Metal Co.	Philadelphia, Pa.	W
324	450–360	870–695	2200	60	10" Merchant Mill	Geared	1914	Cleveland Hardware Co.	Cleveland, Ohio	W
325	450–360	875–700	2200	60	9" Merchant Mill	Geared	1915	National Lock Washer Co.	Riverside, N. J.	W
326	475–350	240–181	440	25	10" Merchant Mill	Direct	1914	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
327	485–360	870–695	2200	60	10" Merchant Mill	Geared	1915	Old Dominion Iron & Nail Co.	Richmond, Va.	W
328	500	0–200	500	d.c.	78" Reversing Brass Plate	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
329	500	88	6600	25	16" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
330	500–385–250	130–100–65	440	25	14" Merchant Mill	Direct	1923	Halcomb Steel Co.	Syracuse, N. Y.	GE
331	500	150–225	250	d.c.	12" Merchant Mill	Direct	1919	National Farming Mach. Co., Ltd.	Montmagny, P. Q.	W
332	500	155–500	250	d.c.	Tyre Mill	Direct	1923	McConway Torley Co.	Pittsburgh, Pa.	W
333	500	184	2200	25	12" Merchant Mill	Rope	1905	Ontario Iron & Steel Co.	Welland, Ont.	W
334	500	184	2200	25	16" Merchant Mill	Direct	1908	Bethlehem Steel Co.	Johnstown, Pa.	W
335	500	190	230	d.c.	18" Tandem Rough. Mill	Rope	1910	Sharon Steel Hoop Co.	Sharon, Pa.	GE
336	500	190	230	d.c.	24" Blooming Mill	Geared	1910	Sharon Steel Hoop Co.	Sharon, Pa.	GE
337	500	200–400	250	d.c.	10" Cont. Mill	Coupled	1925	Republic Iron & Steel Co.	Youngstown, Ohio	AC
338	500	214	6600	25	Axle Mill	Geared	1909	Illinois Steel Co.	Gary, Ind.	GE
339	500	220–400	550	d.c.	Brass Mill	Geared	1913	Scoville Manufacturing Co.	Waterbury, Conn.	W
340	500	220–400	550	d.c.	Brass Mill	Geared	1913	Scoville Manufacturing Co.	Waterbury, Conn.	W
341	500	220–400	550	d.c.	Brass Mill	Geared	1913	Scoville Manufacturing Co.	Waterbury, Conn.	W
342	500	220–400	550	d.c.	Brass Mill	Geared	1913	Scoville Manufacturing Co.	Waterbury, Conn.	W
343	500	220–400	550	d.c.	Brass Mill	Geared	1913	Scoville Manufacturing Co.	Waterbury, Conn.	W
344	500	234	2200	60	Tube Mills	Coupled	1922	Pittsburgh Steel Products Co.	Allenport, Pa.	CW
345	500–330	242–161	440	25	16" and 10" Merchant Mill	Direct & Rope	1913	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
346	500	244	2200	25	10" Merchant Mill	Direct	1908	Bethlehem Steel Co.	Johnstown, Pa.	W
347	500–500	250–325	230	d.c.	8" Hoop Mill	Direct	1909	Atlantic Steel Co.	Atlanta, Ga.	GE
348	500	250–500	230	d.c.	9" Hoop Mill Finishing	Direct	1914	Sharon Steel Hoop Co.	Sharon, Pa.	W
349	500	250	440	25	10" Bar Mill	Geared	1917	Simonds Manufacturing Co.	Lockport, N. Y.	GE
350	500	250	2200	60	Tube Mill	Coupled	1918	Pittsburgh Steel Products Co.	Allenport, Pa.	CW
351	500	250	2200	60	Tube Mill	Geared	1918	Pittsburgh Steel Products Co.	Allenport, Pa.	CW
352	500	250	6600	25	Sheet Mill Cold Rolls	Geared	1919	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
353	500	250–350	600	d.c.	9" Merchant Mill	Direct	1921	Missouri Rolling Mill Co.	St. Louis, Mo.	W
354	500	250–600	250	d.c.	12-9" Mill	Coupled	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
355	500	290	4000	60	8" Merchant Mill	Direct	1920	Calumet Steel Co.	Cicago, Ill.	W
356	500	290	2200	25	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
357	500	300	2200	60	Sheet Mill		1915	U. S. Aluminum Co.	New Kensington, Pa.	AC
358	500	300	2200	60	Sheet Mill		1915	U. S. Aluminum Co.	New Kensington, Pa.	AC
359	500	300	2200	60	Sheet Mill		1915	U. S. Aluminum Co.	New Kensington, Pa.	AC
360	500	300	2200	60	Squeezer	Geared	1919	Pacific Coast Steel Co.	Seattle, Wash.	AC
361	500	300	2200	60	Bar Mill	Coupled	1920	Ft. Wayne Rolling Mill Co.	Ft. Wayne, Ind.	AC
362	500	300–450	230	d.c.	Lap Welding Mill	Coupled	1923	Gary Tube Co.	Gary, Ind.	AC
363	500	320	2200	60	12" Merchant Mill	Geared	1919	Baltimore & Ohio Railroad	Cumberland, Md.	W
364	500–500	327–200	440	60	9" Merchant Mill	Direct	1913	Bourne-Fuller Co.	Cleveland, Ohio	GE
365	500	350	2200	60	Cold Rolling Mill	Geared	1916	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	W
366	500	350	440	60	Cold Rolling Mill	Geared	1916	Andrews Steel Co.	Newport, Ky.	W
367	500	360	2200	25	8" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Johnstown, Pa.	W
368	500	360	2200	60	Tube Mill	Geared	1915	American Brass Company	Waterbury, Conn.	GE
369	500	360	2200	60	16" Bar Mill	Geared	1915	Tennessee Coal, Iron & R. R. Co.	Bessemer, Ala.	GE
370	500	360	2200	60	Copper Mill	Geared	1917	Anaconda Copper Mining Co.	Black Eagle, Mont.	GE
371	500	360	2200	60	Sheet Mill, Cold Rolls	Geared	1920	Central Steel Co.	Massillon, Ohio	GE
372	500	360	2200	60	Sheet Mill, Cold Rolls	Geared	1920	Central Steel Co.	Massillon, Ohio	GE
373	500	360	2200	60	Sheet Mill, Cold Rolls	Geared	1920	Republic Iron & Steel Co.	Youngstown, Ohio	GE
374	500	360	2200	60	Billet Piercing Mill	Geared	1922	Weldless Tube Co.	Wooster, Ohio	GE
375	500	360	440	60	Brass Mill	Direct	1923	Rome Brass and Copper Co.	Rome, N. Y.	GE
376	500	360	440	60	Brass Mill	Direct	1923	Rome Brass and Copper Co.	Rome, N. Y.	GE
377	500	360–612	600	d.c.	Reversing Hot Mill	Geared	1925	Mich. Copper & Brass Co.	Detroit, Mich.	GE
378	500	365	440	25	Copper Rolling Mill	Rope	1922	Baltimore Copper Smelt.& Roll.Co.	Baltimore, Md.	W
379	500	368	2200	25	Brass Mill	Geared	1920	American Brass Company	Kenosha, Wis.	W
380	500	375	2200	25	Wheel Mill	Geared	1913	Bethlehem Steel Co.	Johnstown, Pa.	AC
381	500	375	2300	25		Geared	1919	Buffalo Copper & Brass Co.	Buffalo, N. Y.	AC
382	500	375	2300	25		Geared	1925	Buffalo Copper & Brass Co.	Buffalo, N. Y.	AC
383	500–500	400–600	230	d.c.	Hoop Mill	Geared	1920	Atlantic Steel Co.	Atlanta, Ga.	GE
384	500	435	440	60	8" Merchant Mill	Rope	1911	Carnegie Steel Co. Painter Mills	Pittsburgh, Pa.	W
385	500	435	440	60	8" Merchant Mill	Rope	1912	Carnegie Steel Co. Painter Mills	Pittsburgh, Pa.	W
386	500	435	440	60	8" Merchant Mill	Rope	1912	Carnegie Steel Co. Painter Mills	Pittsburgh, Pa.	W
387	500	435	440	60	9" Merchant (Fin.) Mill	Belted	1914	Carnegie Steel Co. Painter Mills	Pittsburgh, Pa.	W
388	500	435	440	60	10" Merchant Mill	Belted	1914	Carnegie Steel Co. Painter Mills	Pittsburgh, Pa.	W
389	500	435	2200	60	Merchant Mill	Geared	1916	Seymour Manufacturing Co.	Waterbury, Conn.	W
390	500	440	2200	60	Copper Rod Mill	Geared	1923	American Brass Company	Kenosha, Wis.	W
391	500	440	2200	60	Roughing Mill	Geared	1924	Universal Steel Co.		AC
392	500	440	4000	60		Coupled	1923	Bryden Neverslip Co.	Catasauqua, Pa.	AC
393	500	442	2200	60	Cold Rolling Mill	Geared	1922	Follansbee Bros. Co.	Toronto, Ohio	W

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
394	500	450	440	60	Bar Mill	Geared	1910	Chase Rolling Mills Co.	Waterbury, Conn.	GE
395	500	450	440	60	Bar Mill	Geared	1910	Chase Rolling Mills Co.	Waterbury, Conn.	GE
396	500	450	550	60	12" Cold Roll Mill	Geared	1914	Worcester Pressed Steel Co.	Worcester, Mass.	GE
397	500	450	440	60	16" Bar Mill	Geared	1914	Carbon Steel Co.	Pittsburgh, Pa.	GE
398	500	450	2200	60	Brass Mill	Geared	1915	Scoville Manufacturing Co.	Waterbury, Conn.	GE
399	500	450	2200	60	Brass Mill	Geared	1915	Scoville Manufacturing Co.	Waterbury, Conn.	GE
400	500	450	2200	60	Brass Mill	Geared	1915	Scoville Manufacturing Co.	Waterbury, Conn.	GE
401	500	450	2200	60	Brass Mill	Geared	1915	Chase Metal Works	Waterbury, Conn.	GE
402	500	450	2200	60	Billet Mill	Geared	1915	International High Speed Steel Co.	Rockaway, N. J.	GE
403	500	450	2200	60	Sheet Mill	Geared	1915	American Brass Company	Torrington, Conn.	GE
404	500	450	2200	60	Tube Mill	Geared	1916	Ohio Seamless Tube Co.	Shelby, Ohio	GE
405	500	450	440	60	20" Copper Mill	Geared	1916	Waclark Wire Co.	Elizabeth, N. J.	GE
406	500	450	440	60	Wire Mill	Geared	1916	Waclark Wire Co.	Elizabeth, N. J.	GE
407	500	450	2300	60	Merchant Mill	Geared	1916	Pacific Coast Steel Co.	San Francisco, Cal.	GE
408	500	450	2200	60	Copper Mill	Geared	1917	Anaconda Copper Mining Co.	Black Eagle, Mont.	GE
409	500	450	2200	60	Copper Mill	Geared	1917	Anaconda Copper Mining Co.	Black Eagle, Mont.	GE
410	500	450	2200	60	Brass Mill	Geared	1917	American Brass Company	Waterbury, Conn.	GE
411	500	450	2200	60	Brass Mill	Geared	1917	American Brass Company	Waterbury, Conn.	GE
412	500	450	440	60	20" Copper Mill	Coupled	1918	Waclark Wire Co.	Bayway, N. J.	CW
413	500	450	2200	60	Tube Mill	Geared	1919	Ohio Seamless Tube Co.	Shelby, Ohio	GE
414	500	450	440	60	Brass Sheet Mill	Geared	1920	Detroit Copper & Brass Co.	Detroit, Mich.	GE
415	500	450	2200	60	Brass Mill	Geared	1921	American Brass Company	Torrington, Conn.	GE
416	500	450	2200	60	Brass Mill	Geared	1921	American Brass Company	Torrington, Conn.	GE
417	500	450	2200	60	14" Roughing Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	AC
418	500	450	2200	60	9" Finishing Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	AC
419	500	450	2200	60	Hoop Mill	Geared	1912	Carnegie Steel Co.	Pittsburgh, Pa.	CW
420	500	450	2200	60	Bar Mill	Geared	1925	Indianapolis Steel Products Co.	Indianapolis, Ind.	AC
421	500	480-250	230	d.c.	Merchant Mill	Coupled	1923	Buffalo Bolt Co.	N. Tonawanda, N. Y.	CW
422	500	487	6600	25	8" Merchant Mill	Direct	1913	Minnesota Steel Co.	Duluth, Minn.	W
423	500	500	2300	25	Milling Machine	Direct	1914	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
424	500-500-500	500-375-265	2200	25	10" Merchant Mill	Direct & Belt	1916	Donner Steel Co.	Buffalo, N. Y.	GE
425	500	500	550	25	Tube Mill	Geared	1917	Baltimore Tube Co.	Baltimore, Md.	W
426	500	500	2300	25	18" Merchant Mill	Geared	1919	Halcomb Steel Co.	Syracuse, N. Y.	GE
427	500	500	2200	25	16" Bar Mill	Geared	1919	Hammond Steel Co.	Solvay, N. Y.	GE
428	500	500	2200	25	Continuous Tube Mill	Coupled	1915	Pittsburgh Steel Products Co.	Monessen, Pa.	CW
429	500	514	440	60	Bar Mill	Chain	1915	Simmons Mfg. Co.	Kenosha, Wis.	AC
430	500	514	2200	60	Bar Mill	Rope	1917	Henry Disston & Son	Philadelphia, Pa.	AC
431	500	514	550	60	18" Copper Mill	Geared	1919	National Conduit & Cable Co.	Hastings, N. Y.	GE
432	500	514	2200	60	Bar Mill	Geared	1919	Judson Mfg. Co.	Oakland, Calif.	AC
433	500	514	2200	60	Bar Mill	Geared	1920	Metals Production Equipment Co.	Springfield, Mass.	AC
434	500	514	2200	60	Bar Mill	Geared	1920	Metals Production Equipment Co.	Springfield, Mass.	AC
435	500	514	2200	60	Bar Mill	Geared	1920	Metals Production Equipment Co.	Springfield, Mass.	AC
436	500	514	2200	60	Brass Mill	Geared	1922	Western Cartridge Co.	East Alton, Ill.	GE
437	500	575-865	2200	60	10" Merchant Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	W
438	500	575-865	2200	60	10" Merchant Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	W
439	500	575	2200	60	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
440	300	575	2200	60	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
441	500	575	2200	60	Copper Rod Mill	Geared	1923	American Brass Company	Kenosha, Wis.	W
442	500	585	2200	60	Copper Rod Mill	Geared	1922	Eugene F. Phillips Elec. Wks., Ltd.	Montreal, Que.	W
443	500	600	2200	60			1913	Cleveland Brass & Copper Co.	Cleveland, Ohio	AC
444	500	600	2200	60	Brass Mill	Geared	1917	American Brass Company	Waterbury, Conn.	GE
445	500	600	2200	60	Brass Mill	Geared	1917	American Brass Company	Waterbury, Conn.	GE
446	500	600	2200	60	Brass Mill	Geared	1917	American Brass Company	Torrington, Conn.	GE
447	500	600	2200	60	Bar Mill	Belted	1919	Joslyn Mfg. Co.	Chicago, Ill.	AC
448	500	600	2200	60	Merchant Mill	Geared	1923	Taunton-New Bedford Copper Co.	Taunton, Mass.	GE
449	500	600	2200	60	Copper Rolling Mill	Geared	1923	American Brass Company	Torrington, Conn.	GE
450	500	600	2200	50	Reducing Pipe Mill	Geared	1925	Ohio Seamless Tube Co.	Shelby, Ohio	GE
451	500	730-485	2200	50	8" Merchant Mill	Geared	1919	Southern California Iron & Steel Co.	Los Angeles, Cal.	W
452	500-250	750-375	3000	50	Merchant Mill	Geared	1923	Consolidated Rolling Mills Co.	Mexico City, Mex.	GE
453	500-400	775-585	550	40	10" Merchant Mill	Geared	1917	Cohoes Rolling Mill Co.	Cohoes, N. Y.	W
454	500	870	2200	60	16" Merchant Mill	Geared	1919	McConway-Torley Co.	Pittsburgh, Pa.	W
455	500-400	875-700	550	60	10"-14" Merchant Mill	Geared	1916	The Texas Steel Co.	Fort Worth, Texas	W
456	500	884	2200	50	9" Rougher	Geared	1925	Crucible Steel Co.	Atha Works	W
457	500	888-540	6600	60	11" Finishing Stand	Coupled		Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
458	500-250	890-513 440-256	2200	60	10" Merchant Mill	Geared	1919	Hunter Crucible Steel Co.	Cleveland, Ohio	W
459	500	900	440	50	10" Merchant Mill	Geared	1925	Latrobe Elec. Steel Co.	Latrobe, Pa.	GE
460	525	125	2200	25	Merchant Mill	Rope	1910	American Sheet & Tin Plate Co.	Gary, Ind.	GE
461	525	125	2200	25	Merchant Mill	Rope	1910	American Sheet & Tin Plate Co.	Gary, Ind.	GE
462	550	120-300	250	d.c.	10" Merchant Mill	Direct	1923	Firth Sterling Steel Co.	McKeesport, Pa.	W
463	550	320-206	2200	60	10" Hoop Mill	Direct	1917	Atlantic Steel Co.	Atlanta, Ga.	W
464	550	575	2200	60	16" Skelp Mill	Geared	1919	Tyler Tube & Pipe Co.	Washington, Pa.	W
465	550-360	875-585	2200	50	12" Merchant Mill	Geared	1918	Norfolk & Western Railroad	Roanoke, Va.	W
466	550	880	2200	60	16" Merchant Mill	Geared	1919	Danville Structural Tubing Co.	Danville, Pa.	W
467	550	880	2200	60	Merchant Mill	Geared	1921	Danville Structural Tubing Co.	Danville, Pa.	W
468	575	300-214	6600	25	10" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
469	575-575	375-250	6600	25	8" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
470	600	150	550	60	Sheet Mill, Cold Rolls	Rope	1909	Weirton Steel Co.	Weirton, W. Va.	GE
471	600-600	150-250	575	d.c.	6" Hot Strip Mill	Direct	1913	American Steel & Wire Co.	Cleveland, Ohio	GE
472	600	171	440	40	Bar Mill	Geared	1910	Ludlum Steel Co.	Watervliet, N. Y.	GE
473	600	200-300	230	d.c.	9" Merchant Mill	Direct	1914	United Alloy Steel Corporation	Canton, Ohio	W
474	600	200-300	230	d.c.	9" Merchant (Fin.) Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
475	600-600	214- 93	6600	25	12" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
476	600	214	440	25			1920	Baltimore Copper S. & R. Co.	Baltimore, Md.	AC
477	600	214	440	25			1920	Baltimore Copper S. & R. Co.	Baltimore, Md.	AC
478	600-600	225-425	550	d.c.	12" Hot Strip Mill	Direct	1916	American Steel & Wire Co.	Cleveland, Ohio	GE
479	600-525	250-125	2200	25	16" & 14" Merchant Mill	Direct & Rope	1913	Bethlehem Steel Co.	Steelton, Pa.	GE
480	600-600	300-214	2200	25	Bar Mill	Coupled & Rope	1914	St. Louis Screw Co.	St. Louis, Mo.	AC
481	600	300-214	2200	25	Bar Mill	Chain	1914	St. Louis Screw Co.	St. Louis, Mo.	AC
482	600	300	2200	25	Muck Mill	Chain	1914	St. Louis Screw Co.	St. Louis, Mo.	AC
483	600	300	2200	60	Sheet Mill	Geared	1917	Universal Rolling Mill Co.	Bridgeville, Pa.	AC
484	600	300	2200	60	Tube Mill	Coupled	1918	Pittsburgh Steel Products Co.	Allenport, Pa.	CW
485	600	300	440	25	Tandem Plate Mill	Rope	1920	Baltimore Copper S. & R. Co.	Baltimore, Md.	AC
486	600	300	440	25	Tandem Plate Mill	Rope	1920	Baltimore Copper S. & R. Co.	Baltimore, Md.	AC
487	600	300	2200	60	Tube Mill	Coupled	1917	Pittsburgh Steel Products Co.	Monessen, Pa.	CW
488	600	300-330	230	d.c.	10" Bar Mill	Coupled	1921	Universal Steel Co.	Bridgeville, Pa.	CW
489	600-400-200	321-214-107	440	25	9" Merchant Mill	Direct	1923	Halcomb Steel Co.	Syracuse, N. Y.	GE
490	600	360	2200	60	Tube Mill	Geared	1914	Standard Seamless Tube Co.	Economy, Pa.	GE
491	600	360	2200	60	10" Hot Strip Mill	Direct	1919	Superior Steel Co.	Carnegie, Pa.	GE
492	600	360-440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Maryaville, Tenn.	W
493	600	360-440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Maryaville, Tenn.	W
494	600	360-440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Maryaville, Tenn.	W
495	600	360	440	60	Copper Mills	Geared	1923	Am. Insulated Wire & Cable Co.	Chicago, Ill.	GE
496	600	365	6600	25	10" Merchant Mill	Direct	1913	Minnesota Steel Co.	Duluth, Minn.	W
497	600	368	6600	25	18"-21" Roughing Mill	Geared	1924	Pittsburgh Crucible Steel Co.	Midland, Pa.	AC
498	600-400	375-210	2200	25	9" Merchant Mill	Direct	1912	Gulf States Steel Co.	Birmingham, Ala.	GE
499	600	390	440	60	20" Merchant Mill	Geared	1916	Stanley Works	New Haven, Conn.	W
500	600	390	440	60	Cold Strip Mill	Geared	1917	Stanley Works	New Haven, Conn.	W

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
501	600	440	2200	60	10" Rod Mill	Direct	1917	Wickwire Spencer Steel Corp.	Palmer, Mass.	W
502	600	450	2200	60	Aluminum Strip Mill	Geared	1914	Cleveland Metal Products Co.	Cleveland, Ohio	GE
503	600-600-600	469-375-281	2200	25	8" Merchant Mill	Direct	1919	Donner Steel Co.	Buffalo, N. Y.	GE
504	600	485	2200	25	10" Merchant Mill	Direct	1912	Laclede Steel Co.	Alton, Ill.	W
505	600	485	440	25	20" Merchant Mill	Geared	1915	Hess Steel Corporation	Baltimore, Md.	W
506	600	485	550	25	Piercing Mill	Geared	1915	Baltimore Tube Co.	Baltimore, Md.	W
507	600	490	2200	25	16" Bar Roughing Mill	Geared	1919	Scullin Steel Co.	St. Louis, Mo.	W
508	600	500	2200	60	20" Merchant Mill	Geared	1916	Carpenter Steel Co.	Reading, Pa.	W
509	600	500	2200	60	16" Merchant Mill	Geared	1917	Central Steel Co.	Massillon, Ohio	W
510	600	500	440	25	16" Merchant Mill	Geared	1919	Buffalo Bolt Co.	N.Tonawanda, N. Y.	GE
511	600	500	575	25	Brass Sheet Mill	Geared	1920	Baltimore Tube Co.	Baltimore, Md.	GE
512	600	500	575	25	Brass Sheet Mill	Geared	1920	Baltimore Tube Co.	Baltimore, Md.	GE
513	600-400	514-300	2200	60	Rod Mill	Direct	1912	Oliver Iron & Steel Co.	Pittsburgh, Pa.	GE
514	600	514	2200	60	Brass Mill	Geared	1922	Western Cartridge Co.	East Alton, Ill.	GE
515	600	585-325	550	40	16" Merchant Mill	Geared	1917	Cohoes Rolling Mill Co.	Cohoes, N. Y.	W
516	600-500-400	600-500-400	2200	25	Merchant Mill, No. 10	Direct	1916	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
517	600	600	4000	60	Brass Mill	Geared	1919	Bristol Brass Co.	Bristol, Conn.	GE
518	600	600	2200	60	Copper Mill	Geared	1920	American Brass Co.	Waterbury, Conn.	GE
519	600	600	440	60	16" Merchant Mill		1920	Wayne Steel Co.		AC
520	600	600	2300	60		Coupled		Fulton Steel Corp.	Fulton, N. Y.	AC
521	600	600	2200	60	Brass Mill	Geared	1921	American Brass Co.	Waterbury, Conn.	GE
522	600	600	550	60	Copper Rod Mill	Geared	1925	Phillips Wire Co.	Pawtucket, R. I.	GE
523	600-600	720-360	6600	60	Hot Strip Mill	Geared		Weirton Steel Co.	Weirton, W. Va.	AC
524	600	885	2200	60	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
525	600	885	2200	60	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
526	600	900	440	60	Copper Rod Mill	Geared	1920	Western Elec. Co.	Hawthorne, Ill.	GE
527	600	900	550	60	Brass Mill	Geared	1920	American Brass Co.	Ansonia, Conn.	GE
528	600	900	440	60	Copper Mill	Geared	1923	Am. Insulated Wire & Cable Co.	Chicago, Ill.	GE
529	650	160	440	60	14" Guide Mill	Coupled		Withrow Steel Co.	Neville Island, Pa.	AC
530	650	184	6600	25	18" Merchant Mill	Direct	1909	Indiana Steel Co.	Gary, Ind.	W
531	650	184	6600	25	14" Merchant Mill	Direct	1909	Indiana Steel Co.	Gary, Ind.	W
532	650	200	440	60	14" Guide Mill	Coupled		Withrow Steel Co.	Neville Island, Pa.	AC
533	650	210	6600	25	12" Merchant Mill	Geared	1909	Indiana Steel Co.	Gary, Ind.	W
534	650	225-400	600	d.c.	Seamless Mill	Geared	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
535	650	225-400	600	d.c.	Seamless Mill	Geared	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
536	650	225-400	600	d.c.	Seamless Mill	Geared	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
537	650	293	2200	60	9" Merchant Mill	Rope	1919	Harrisburg Pipe & Pipe Bending Co.	Harrisburg, Pa.	W
538	650	500	6600	25	10" Merchant Mill	Direct	1916	Illinois Steel Co.	Gary, Ind.	GE
539	650	500	6600	25	10" Merchant Mill	Direct	1916	Illinois Steel Co.	Gary, Ind.	GE
540	650	750	2200	25			1913	Bethlehem Steel Co.	Johnstown, Pa.	AC
541	650	750	2200	25				Bethlehem Steel Co.	Johnstown, Pa.	AC
542	700	86	450	d.c.	Shear Intensifier	Direct	1918	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
543	700	135-360	240	d.c.	Merchant Mill	Direct	1923	Atlas Steel Corporation	Dunkirk, N. Y.	W
544	700	150	2200	60	Piercing Mill	Rope	1916	Ohio Seamless Tube Co.	Shelby, Ohio	GE
545	700	187	2200	25	14" Merchant Mill	Direct	1920	Donner Steel Co.	Buffalo, N. Y.	GE
546	700	250	2200	25	18" Bar Mill	Rope	1911	Dillworth Porter Co.	Pittsburgh, Pa.	GE
547	700	250-450	250	d.c.	9" Merchant Mill	Direct	1925	Crucible Steel Co.	Pittsburgh, Pa.	GE
548	700	295	440	60		Geared	1925	Witherow Steel Co.	Neville Island, Pa.	AC
549	700	300	3300	25			1922	Woodward Iron Co.	Woodward, Ala.	AC
550	700	300-400	230	d.c.	Lap Welding Mill	Coupled		Gary Tube Co.	Gary, Ind.	AC
551	700	320	2200	60	Sheet and Jobbing Mill	Direct	1917	Carbon Steel Co.	Pittsburgh, Pa.	W
552	700	360	440	60	Brass Mill	Chain		Detroit Copper & Brass Co.	Detroit, Mich.	AC
553	700	364	2200	25	8" Merchant Mill	Direct	1912	Laclede Steel Co.	Alton, Ill.	W
554	700	390	2200	60	18" Bar Mill	Geared	1922	Dilworth Porter Co.	Pittsburgh, Pa.	W
555	700-600-400	400-300-200	2200	25	Merchant Mill, No. 10	Direct	1916	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
556	700-600-400	400-300-200	1200	25	Merchant Mill, No. 10	Belt		Bethlehem Steel Co.	Lackawanna, N. Y.	GE
557	700	480-290	2200	25	12" Merchant Mill	Geared	1916	Halcomb Steel Co.	Syracuse, N. Y.	W
558	700	490	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
559	700	490	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
560	700	502	2200	60	Cold Rolling Mill	Direct	1919	Carnahan Tin Plate & Steel Co.	Canton, Ohio	W
561	700	585	2200	60	Copper Rod Mill	Geared	1922	Eugene F. Phillips Elec. Wks., Ltd.	Montreal, Que.	W
562	700	600	2200	60	14" Bar Mill	Coupled	1921	Universal Steel Co.	Bridgeville, Pa.	CW
563	700	730-490	4000	25	14" Merchant Mill	Geared	1918	Atlas Steel Corporation	Dunkirk, N. Y.	W
564	700	735	4000	25	14" Merchant Mill	Geared	1921	Atlas Steel Corporation	Dunkirk, N. Y.	W
565	700	735	440	25	Copper Rolling Mill	Geared	1924	Baltimore Cop.Smelt. & Rolling Co.	Baltimore, Md.	W
566	700	735	440	25	Copper Rolling Mill	Geare	1924	Baltimore Cop.Smelt. & Rolling Co.	Baltimore, Md.	W
567	700	735	440	25	Copper Rolling Mill	Geare	1924	Baltimore Cop.Smelt. & Rolling Co.	Baltimore, Md.	W
568	700	750	2200	25		Geared		Bethlehem Steel Company	Buffalo, N. Y.	AC
569	700	750	2200	25				Bethlehem Steel Company	Buffalo, N. Y.	AC
570	700	875	2200	60	Cont. Hoop (Rough). Mill	Geared	1920	Connors Steel Co.	Birmingham, Ala.	W
571	700	875	2200	60	Cont. Hoop (Intermed.)	Geared	1920	Connors Steel Co.	Birmingham, Ala.	W
572	700	880-530	2200	60	10" Finishing Mill	Geared	1923	Crucible Steel Works of America, Park Works		W
573	700	1200	6600	50				Weirton Steel Co.	Weirton, W. Va.	AC
574	700	1200	6600	50				Weirton Steel Co.	Weirton, W. Va.	AC
575	750	94	2200	25	Sheet Mill	Rope	1912	West Penn. Steel Co.	Brackenridge, Pa.	GE
576	750	100	2200	25	Tin Mill, Cold Rolls	Geared	1915	American Sheet & Tin Plate Co.	Gary, Ind.	GE
577	750	100	2200	25	Tin Mill, Cold Rolls	Geared	1915	American Sheet & Tin Plate Co.	Gary, Ind.	GE
578	750	120-210	250	d.c.	14" Finishing Mill	Coupled	1923	Pittsburgh Crucible Steel Co.	Midland, Pa.	AC
579	750	120-210	250	d.c.	14" Finishing Mill	Coupled	1923	Pittsburgh Crucible Steel Co.	Midland, Pa.	AC
580	750	125	2200	25	Tin Mill, Cold Rolls	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
581	750	125	2200	25	Tin Mill, Cold Rolls	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
582	750	130	550	d.c.	Wheel Mill	Direct	1915	Carnegie Steel Co.	McKees Rocks, Pa.	GE
583	750	150-250	600	d.c.	14" Merchant Mill	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
584	750	160	550	d.c.	Wheel Mill	Direct	1916	Edgewater Steel Co.	Oakmont, Pa.	GE
585	750	160	550	d.c.	Wheel Mill	Direct	1916	Edgewater Steel Co.	Oakmont, Pa.	GE
586	750	160	550	d.c.	Wheel Mill	Direct	1919	Edgewater Steel Co.	Oakmont, Pa.	GE
587	750-750	225-168	440	60	Bar Mill	Coupled	1921	Simmons Mfg. Co.	Kenosha, Wis.	AC
588	750-750	235-325	230	d.c.	Piercing Mill	Geared	1914	Pittsburgh Seamless Tube Co.	Beaver Falls, Pa.	GE
589	750	240	2200	60	Sheet Mill, Cold Rolls	Geared	1919	Wheeling Steel Corp.	Steubenville, Ohio	GE
590	750	250	2200	25	Bar Mill	Geared	1914	Bethlehem Steel Co.	Johnstown, Pa.	AC
591	750	250	2200	60	Tin Mill	Geared	1915	Weirton Steel Co.	Weirton, W. Va.	W
592	750	250	440	25	Bar Mill	Coupled	1920	Simonds Mfg. Co.	Lockport, N. Y.	AC
593	750	257	2200	60	10" Strip Mill	Coupled	1923	Pittsburgh Steel Co.	Glassport, Pa.	CW
594	750	277	2200	60	18" Merchant Mill	Geared	1915	Pacific Coast Steel Co.	San Francisco, Cal.	GE
595	750	295	6600	25	Seamless Mill	Geared	1923	Gary Tube Company	Gary, Ind.	W
596	750	300-600	230	d.c.	Cold Rolling Mill	Geared	1924	International Nickel Co.	Huntington, W. Va.	AC
597	750	353	2200	60	Tube Rolling Mill	Direct	1915	National Tube Co.	Ellwood City, Pa.	W
598	750	353	2200	60	Tube Rolling Mill	Direct	1915	National Tube Co.	Ellwood City, Pa.	W
599	750	353	2200	60	Tube Rolling Mill	Direct	1915	National Tube Co.	Ellwood City, Pa.	W
600	750	353	2200	50	Piercing Mill	Direct	1915	National Tube Co.	Ellwood City, Pa.	W
601	750	353	2200	60	Piercing Mill	Direct	1915	National Tube Co.	Ellwood City, Pa.	W
602	750	353	2200	60	Piercing Mill	Direct	1915	National Tube Co.	Ellwood City, Pa.	W
603	750	353	4600	60	Brass Mill	Geared	1924	Scoville Mfg. Co.	Waterbury, Conn.	W
604	750-625-460	360-300-220	6600	25	12" Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
605	750	360	4600	50			1921	Detroit Copper & Brass Co.	Detroit, Mich.	AC
606	750-750	360-860	600	d.c.	14" Continuous Mill	Geared	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
607	750	443	4600	60		Coupled	1921	Detroit Copper & Brass Co.	Detroit, Mich.	AC
608	750-600-440	473-375-278	6600	25	12" Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
609	750	500	230	d.c.	14" Rail Rerolling Mill	Geared	1925	Ford Motor Co.	River Rouge, Mich.	AC
610	750	505	2200	60		Geared	1924	Kansas City Bolt & Nut Co.	Kansas City, Mo.	AC

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
611	750	514	2200	60	Wire Red Mill	Geared	1917	Kokomo Stee & Wire Co.	Kokomo, Ind.	AC
612	750	514	440	60	14" Merchant Mill	Geared	1920	Withrow Steel Co.	Neville Island, Pa.	AC
613	750	514	550	60	10" and 9" Copper Mills	Geared	1919	National Conduit & Cable Co.	Hastings, N. Y.	GE
614	750	514	550	60	10" and 9" Copper Mills	Geared	1919	National Conduit & Cable Co.	Hastings, N. Y.	GE
615	750	514	2200	50				W. M. Lewis	Indianapolis, Ind.	AC
616	750	600	4000	60	Brass Mill	Geared	1919	Bristol Brass Co.	Bristol, Conn.	GE
617	750	720	2200	60	Zinc Rolling Mill	Geared	1923	American Zinc Products Co.	Greencastle, Ind.	GE
618	750	720	550	50	Brass Rolling Mill	Geared	1925	American Brass Co.	Ansonia, Conn.	GE
619	770-700-630	540-490-440	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
620	800	0-37-70	500	d.c.	Plate Mill	Coupled	1919	Universal Rolling Mill Co.	Bridgeville, Pa.	AC
621	800	94	2200	25	18" Merchant Mill	Direct	1912	Gulf States Steel Co.	Birmingham, Ala.	GE
622	800	100	6600	25	16" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
623	800	107	6600	25	Tube Rolling Mill	Coupled	1925	National Tube Co.	Lorain, Ohio	AC
624	800	109	2200	60	2-21" Rolls	Coupled	1924	Globe Steel Tube Co.	Milwaukee, Wis.	AC
625	800	163	2200	25	22" Merchant Blooming	Rope	1905	Ontario Iron & Steel Co.	Welland, Ont.	W
626	800	189	2200	60	Merchant Mill	Direct	1925	Pacific Coast Steel Co.	San Francisco, Cal.	CW
627	800	200-300	500	d.c.	Piercing Mill	Rope	1913	Pittsburgh Steel Products Co	Monessen, Pa.	W
628	800	200-300	500	d.c.	Piercing Mill	Direct	1912	Pittsburgh Steel Products Co.	Monessen, Pa.	W
629	800-800	200-400	600	d.c.	14" Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
630	800-800	214-167	6600	25	16" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
631	800	214	2200	25	Sheet Mill	Geared	1919	American Sheet & Tin Plate Co.	Gary, Ind.	GE
632	800	214	2200	25	Sheet Mill	Geared	1919	American Sheet & Tin Plate Co.	Gary, Ind.	GE
633	800	220-150	2200	25	12" Bar (Finishing) Mill	Direct	1919	Scullin Steel Co.	St. Louis, Mo.	W
634	800	225	2200	60	Roughing Mill	Geared	1916	Standard Seamless Tube Co.	Economy, Pa.	GE
635	800-800	231-462	600	d.c.	14" Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
636	800	250-500	230	d.c.	14" and 9" Hoop Mill	Direct	1914	Sharon Steel Hoop Co.	Sharon, Pa.	W
637	800	250	2200	60	Piercing Mill	Geared	1915	Timken Roller Bearing Co.	Canton, Ohio	W
638	800	250	2200	60	22" Bar Mill	Rope	1915	Timken Roller Bearing Co.	Canton, Ohio	W
639	800-800	256-512	600	d.c.	14" Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
640	800	257	2200	60	Bar Mill	Geared	1914	Standard Seamless Tube Co.	Economy, Pa.	GE
641	800	257	2200	60	12" Rod Mill	Belt	1915	Crucible Steel Co. of America	Harrison, N. J.	GE
642	800	257	2200	60	18" Merchant Mill	Geared	1919	Columbia Steel Co.	Pittsburgh, Cal.	GE
643	800	268	2200	60	14"-10" Merchant Mill	Rope	1912	United Alloy Steel Corporation	Canton, Ohio	W
644	800-800	275-550	600	d.c.	14" Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
645	800	275-550	700	d.c.	12" Merchant Mill	Geared	1925	Penn Seaboard Steel Co.	New Castle, Del.	GE
646	800	275-550	700	d.c.	12" Merchant Mill	Geared	1925	Penn Seaboard Steel Co.	New Castle, Del.	GE
647	800	275-550	700	d.c.	9" Merchant Mill	Direct	1925	Penn Seaboard Steel Co.	New Castle, Del.	GE
648	800	277	2200	60	Bar Mill	Geared	1918	Pacific Coast Steel Co.	San Francisco, Calif.	AC
649	800	292	2200	25	18" Tandem Billet Mill	Direct	1912	Laclede Steel Co.	Alton, Ill.	W
650	800	300	2200	50				Pittsburgh Steel Prod. Co.	Monessen, Pa.	AC
651	800-800	315-210	575	d.c.	6" Hot Strip Mill	Direct	1907	American Steel & Wire Co.	Cleveland, Ohio	GE
652	800	320	440	60	9" Merchant Mill	Belted	1914	Carnegie Steel Co. Painter Mills	Pittsburgh, Pa.	W
653	800	320	440	60	10" Merchant Mill	Belted	1914	Carnegie Steel Co. Painter Mills	Pittsburgh, Pa.	W
654	800	350	2200	50	24" Bull Head Rolls of Sheet Bar Mill	Geared	1915	Central Steel Co.	Massillon, Ohio	W
655	800	350	2200	50	Billet Mill	Geared	1915	Milton Manufacturing Co.	Milton, Pa.	W
656	800	350	2200	50	Aluminum Mill	Geared	1915	U. S. Aluminum Co.	Edgewater, N. J.	W
657	800	350-700	600	d.c.	20" Merchant Breakd'wn)	Geared	1921	Driver Harris	Harrison, N. J.	W
658	800	350-750	600	d.c.	8" Cont. Merchant Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
659	800	353	2200	60	12"-5 Stand Merch. Mill	Belt	1924	United Steel Company	Everett, Wash.	W
660	800	353	440	50	8" Copper Rod Mill	Direct	1923	Standard Underground Cable Co.	St. Louis, Mo.	W
661	800	360-440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
662	800	360-440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
663	800	367	2200	25	8" Merchant Mill	Direct	1918	Donner Steel Co.	Buffalo, N. Y.	W
664	800	370	650	d.c.	Aluminum Mill	Direct	1917	U. S. Aluminum Co.	Niagara Falls, N. Y.	W
665	800	370-400	650	d.c.	Aluminum Mill	Direct	1919	U. S. Aluminum Co.	Niagara Falls, N. Y.	W
666	800	375	2200	25	Sheet Mill, Cold Rolls	Geared	1919	Eastern Rolling Mills Co.	Baltimore, Md.	GE
667	800	375	2200	25	Merchant Mill	Geared	1920	Bethlehem Steel Co.	Johnstown, Pa.	GE
668	800-800	390-260	575	d.c.	6" Hot Strip Mill	Direct	1907	American Steel & Wire Co.	Cleveland, Ohio	GE
669	800	400-600	600	d.c.	16" Merchant Mill	Geared	1921	Missouri Rolling Mills Co.	St. Louis, Mo.	W
670	800	410-720	230	d.c.	16" Merchant (Rough.)	Geared	1923	Timken Roller Bearing Co.	Canton, Ohio	W
671	800	435	2200	50	No. 2 Hoop Mill	Geared	1925	Connors Steel Co.	Birmingham, Ala.	W
672	800	440	2200	50	18" Merchant (Finishing)	Geared	1918	Canton Sheet Steel Co.	Canton, Ohio	W
673	800	443	2200	60	Roughing Mill	Coupled	1921	International Nickel Co.	Huntington, W. Va.	AC
674	800	450	2200	60	14" Merchant Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	AC
675	800	450	2200	60		Coupled	1919	Black Steel & Wire Co.	Kansas City, Mo.	AC
676	800	514	2200	60	Bar Mill	Geared	1919	Judson Mfg. Co.	Oakland, Calif.	AC
677	800	585-292	6600	60	16" Hoop and Band Mill	Geared	1915	Weirton Steel Co.	Weirton, W. Va.	W
678	800-400	600-300	550	40	Bar Mill	Geared	1916	Ludlum Steel Co.	Watervliet, N. Y.	GE
679	800-400	600-300	550	40	Bar Mill	Geared	1917	Ludlum Steel Col.	Warervliet, N. Y.	GE
680	800	705	2200	60	12" Merchant Mill	Geared	1919	McConway-Torley Co.	Pittsburgh, Pa.	W
681	800-363	706-320	600	d.c.	10" Rod Mill	Geared	1922	Wheeling Steel Corp.	Portsmouth, Ohio	GE
682	800-363	705-320	600	d.c.	10" Rod Mill	Geared	1922	Wheeling Steel Corp.	Portsmouth, Ohio	GE
683	800-363	706-320	600	d.c.	10" Rod Mill	Geared	1922	Wheeling Steel Corp.	Portsmouth, Ohio	GE
684	800-800-800	720-600-480	2200	60	12" Hot Strip Mill	Geared	1920	Canadian Elec. Steel Co.	Montreal, Canada	GE
685	800-800-800	720-600-480	2200	60	12" Hot Strip Mill	Geared	1920	Canadian Elec. Steel Co.	Montreal, Canada	GE
686	800	720	4600	50	Rolling Mill	Geared	1925	Mich. Copper & Brass Co.	Detroit, Mich.	AC
687	800	720	4600	50	Rolling Mill	Geared	1925	Mich. Copper & Brass Co.	Detroit, Mich.	AC
688	800	720	4600	50	Rolling Mill	Geared	1925	Mich. Copper & Brass Co.	Detroit, Mich.	AC
689	800	720	4600	50	Rolling Mill	Geared	1925	Mich. Copper & Brass Co.	Detroit, Mich.	AC
690	800	720	4600	50	Rolling Mill	Geared	1925	Mich. Copper & Brass Co.	Detroit, Mich.	AC
691	800	730-365	2200	50	22" Bar Mill	Geared	1916	Columbia Steel Co.	Los Angeles, Cal.	W
692	800	730-365	2200	50	12" Merchant Mill	Geared	1916	Columbia Steel Co.	Los Angeles, Cal.	W
693	800	730-485	2200	50	12" Merchant Mill	Geared	1919	Southern Calif. Iron & Steel Co.	Los Angeles, Cal.	W
694	800	870	2200	60	Copper Rod Mill	Geared	1923	American Brass Company	Kenosha, Wis.	W
695	800	870	2200	60	Copper Rod Mill	Geared	1923	American Brass Company	Kenosha, Wis.	W
696	800	875-700	2200	60	16" Merchant Mill	Geared	1920	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
697	800	880-4?0	2200	60	Bar Mill	Geared	1920	Knoxville Iron Co.	Knoxville, Tenn.	W
698	800	892-623	2200	60	20" Merchant (Finishing)	Geared	1919	Hoosier Rolling Mills Co.	Terre Haute, Ind.	W
699	800	900	440	60	Copper Rod Mill	Geared	1920	Western Electric Co.	Hawthorne, Ill.	GE
700	800-800	900-720	2200	60	9" Merchant Mill	Geared	1923	Knoxville Iron Co.	Knoxville, Tenn.	GE
701	800-800	900-720	2200	50	9" Merchant Mill	Geared	1923	Knoxville Iron Co.	Knoxville, Tenn.	GE
702	840-700-560	360-300-240	6600	25	9" Merchant Mill	Direct	1925	Bethlehem Steel Co.	Bethlehem, Pa.	GE
703	850-570	214-143	6600	25	Merchant Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
704	850-850	214-187	6600	25	10" Merchant Mill	Rope	1916	Illinois Steel Co.	Gary, Ind.	GE
705	850-850	214-187	6600	25	10" Merchant Mill	Rope	1916	Illinois Steel Co.	Gary, Ind.	GE
706	850	505	2200	60	24" Bar (Roughing) Mill	Geared	1919	Central Steel Co.	Massillon, Ohio	W
707	850	710	2200	60	20" Blooming Mill	Geared	1923	Washburn Wire Co.	Phillipsdale, R. I.	W
708	900	94	2200	25	Jobbing Sheet Mill	Rope	1910	American Sheet & Tin Plate Co.	Gary, Ind.	GE
709	900	94	2200	25	Jobbing Sheet Mill	Rope	1910	American Sheet & Tin Plate Co.	Gary, Ind.	GE
710	900	163	2200	50	Wire Rod Mill	Coupled	1917	Kokomo Steel & Wire Co.	Kokomo, Ind.	AC
711	900	163	2200	60		Rope	1919	Black Steel & Wire Co.	Kansas City, Mo.	AC
712	900-720	200-160	220	d.c.	Wheel Mill	Geared	1906	Bethlehem Steel Co.	Johnstown, Pa.	GE
713	900-900	214-150	2200	25	12" Merchant Mill	Direct	1910	Algoma Steel Co.	Sault Ste. Marie,Can.	GE
714	900-710-620	325-257-182	2300	60	10" Hoop Mill	Geared	1918	Acme Steel Goods Co.	Riverdale, Ill.	GE
715	900	425-640	250	d.c.	12-10" Mill	Coupled	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
716	900	900	440	60	Copper Rod Mill	Geared	1920	Western Electric Co.	Hawthorne, Ill.	GE
717	975-375	650-250	600	d.c.	Rod (Roughing) Mill	Geared	1922	Atlantic Steel Co.	Atlanta, Ga.	W
718	975-510	865-450	600	d.c.	Rod (Finishing) Mill	Direct & Belt	1922	Atlantic Steel Co.	Atlanta, Ga.	W
719	1000	50-100	600	d.c.	24" Billet (Roughing)	Direct	1916	American Steel & Wire Co	Cleveland, Ohio	W

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
720	1000	50–175	600	d.c.	24" Mill	Direct	1916	Central Steel Co.	Massillon, Ohio	W
721	1000	83	2200	25	Sheet Mill	Rope	1910	Follansbee Bros.	Follansbee, W. Va.	GE
722	1000	125	230	d.c.	Sheet Bar Mill	Geared	1920	Allegheny Steel Co.	Brackenridge, Pa.	GE
723	1000	133	2200	25	Structural (Finishing)	Direct	1910	Illinois Steel Co.	South Chicago, Ill.	W
724	1000	137	6660	25	Wheel Mill	Geared	1916	Illinois Steel Co.	Gary, Ind.	AC
725	1000	184	2200	25	16" Merchant Mill	Direct	1908	Bethlehem Steel Co.	Johnstown, Pa.	W
726	1000	200–600	600	d.c.	10" Merchant Mill	Geared	1925	McKinney Steel Co.	Cleveland, Ohio	W
727	1000	200–480	250	d.c.	12-9" Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
728	1000	200–480	250	d.c.	12-9" Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
729	1000–2000	200–400–600	250	d.c.	12-10" Gautier Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
730	1000	209	6600	25	14" Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
731	1000	210–510	230	d.c.	Bar Mill	Geared	1925	Donner Steel Co.	Buffalo, N. Y.	W
732	1000	214–150	6400	25	24" Flat (Finishing) Mill	Direct	1916	American Steel & Wire Co.	Cleveland, Ohio	W
733	1000	235	2200	60	Cold Rolled Tin Mill	Coupled	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	AC
734	1000	235	2200	60	Cold Rolled Tin Mill	Coupled	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	AC
735	1000	240	440	60	Sheet Mill		1918	Hudson Sh. & T. P. Co.	Marietta, Ohio	AC
736	1000	240	220	60	Tube Mill	Geared	1919	Globe Seamless Tube Co.	Milwaukee, Wis.	AC
737	1000	240		60	Tube Mill		1917	Pittsburgh Seamless Tube Co.	Beaver Falls, Pa.	CW
738	1000	245	2200	25	30" Sheet Jobbing Mill	Rope	1910	American Rolling Mills Co.	Middletown, Ohio	W
739	1000	250	6600	25	Tin Mill	Geared	1919	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
740	1000	250	6600	25	Tin Mill	Geared	1919	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
741	1000	250	6600	25	Sheet Mill	Geared	1919	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
742	1000	250	6600	25	Sheet Mill	Geared	1919	Bethlehem Steel Co.	Sparrows Point, Md.	GE
743	1000	250	2200	60	18" Merchant Mill	Geared	1918	Canton Sheet Steel Co.	Canton, Ohio	W
744	1000	250	2200	60	Sheet Mill	Geared	1920	American Rolling Mills Co.	Zanesville, Ohio	W
745	1000	250	2200	25	Sheet Mill		1920	Otis Steel Co.	Cleveland, Ohio	AC
746	1000	250	2200	25	Sheet Mill		1920	Otis Steel Co.	Cleveland, Ohio	AC
747	1000	277	2200	60	22" Bar Mill	Geared	1919	Pennsylvania Forge Co.	Philadelphia, Pa.	GE
748	1000	293	6600	25	14" Cont. Skelp Mill	Geared	1924	Gary Tube Co.	Gary, Ind.	AC
749	1000	295	2200	60	12" Cont. & 10" Merch.	Direct	1920	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
750	1000	300	2200	25	10" Merchant Mill	Geared	1916	Halcomb Steel Co.	Syracuse, N. Y.	GE
751	1000	300–150	2200	50	12" Merchant Mill	Direct	1918	Central Steel Co.	Massillon, Ohio	W
752	1000	300	2200	50	Sheet Mill	Geared	1919	Superior Sheet-Steel Co.	Canton, Ohio	GE
753	1000	300	2200	60	Sheet Mill	Geared	1919	Superior Sheet Steel Co.	Canton, Ohio	GE
754	1000	300	2200	60	Sheet Mill	Geared	1920	Milwaukee Rolling Mills Co.	Milwaukee, Wis.	GE
755	1000	300	2200	60	Sheet Mill	Geared	1920	Milwaukee Rolling Mills Co.	Milwaukee, Wis.	GE
756	1000	300	2200	25	Aluminum Rod Mill	Geared	1922	U. S. Aluminum Co.	Massena, N. Y.	GE
757	1000	300–400	230	d.c.	Lap Welding Mill	Coupled	1923	Gary Tube Co.	Gary, Ind.	AC
758	1000	300	2200	50	Sheet Mill	Geared	1925	Sharon Steel Hoop Co.	Sharon, Pa.	CW
759	1000	300	2200	50	Sheet Mill	Geared	1925	Sharon Steel Hoop Co.	Sharon, Pa.	CW
760	1000	300	2200	50	Sheet Mill	Geared	1925	Sharon Steel Hoop Co.	Sharon, Pa.	CW
761	1000	360	2200	50			1921	Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
762	1000	365	2200	50	Merchant Mill	Geared	1923	Columbia Steel Co.	Torrence, Cal.	W
763	1000	375	2200	25	Bar Mill	Geared	1913	Bethlehem Steel Co.	Johnstown, Pa.	AC
764	1200	240		50	Hot Sheet Mill	Coupled	1916	Standard Tin Plate Co.	Canonsburg, Pa.	
765	1000	375	2200	25	Wheel Mill	Geared	1913	Bethlehem Steel Co.	Johnstown, Pa.	AC
766	1000	375	6600	25	Piercing Mill	Geared	1925	National Tube Co.	Lorain, Ohio	AC
767	1000	375	4400	25	Merchant Mill	Geared	1919	Buffalo Bolt Co.	N. Tonawanda, N. Y.	GE
768	1000	435	2200	50		Geared	1924	American Tube & Stamping Co.	Bridgeport, Conn.	W
769	1000	435	2200	50		Geared	1924	American Tube & Stamping Co.	Bridgeport, Conn.	W
770	1000	450	2200	50	Piercing Mill	Geared	1918	Winchester Rep. Arms Co.	Bridgeport, Conn.	AC
771	1000	450	2200	50	Bar Mill	Rope	1919	Pacific Coast Steel Co.	Seattle, Wash.	AC
772	1000	450	2200	60	20" Merchant Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	AC
773	1000	518–800	250	d.c.	20" Merchant Mill	Geared	1919	National Farming Machinery, Ltd.	Montmagny, P. Q.	W
774	1000	590–495	6600	60	24" Structural Mill	Geared	1917	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	W
775	1000	590–450	4000	50	14" Merchant Mill	Geared	1920	Calumet Steel Co.	Chicago, Ill.	W
776	1000	590–450	4000	60	14" Merchant Mill	Geared	1920	Calumet Steel Co.	Chicago, Ill.	W
777	1000	600	2200	50	16" Skelp Mill	Geared	1923	Elyria Iron & Steel Co.	Elyria, Ohio	GE
778	1000	600	2300	50	Copper Mill	Geared	1925	American Copper Products Co.	Elizabeth, N. J.	GE
779	1000	600	2200	50	Hot and Cold Sheet Mills	Geared	1925	American Nickel Corp.	Clearfield, Pa.	GE
780	1000	705	2200	50	16" Strip Mill	Geared	1920	Central Steel Co.	Massillon, Ohio	W
781	1000	720	4000	60	18" 2-Stand Rerolling Rail Mill	Geared	1923	Buckeye Rolling Mill Co.	Newark, Ohio	GE
782	1000	710	2200	50	20" Special Bar Mill	Geared	1925	Rail Joint Company	Troy, N. Y.	W
783	1000	710	2200	60	20" Special Bar Mill	Geared	1925	Rail Joint Company	Troy, N. Y.	W
784	1000	720	6600	50	Rod Mills Nos. 8 and 9	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
785	1000	720	6600	50	Rod Mill No. 7	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
786	1000	725	2200	25	12" Merchant Mill	Geared	1922	Burlington Steel Co., Ltd.	Hamilton, Ont.	W
787	1100–1500	91	2200	25	84" Plate (Fin.) Mill	Direct	1909	American Sheet & Tin Plate Co.	Gary, Ind.	W
788	1125–900–675	312–250–187	6600	25	12" Strip Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
789	1100	294–205	2200	60	20" Merchant Mill	Rope	1912	United Alloy Steel Corporation	Canton, Ohio	W
790	1150	250	6600	25	Jobbing Sheet Mill	Geared	1913	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
791	1180–955–705	560–450–336	2200	60	Rod Mill	Belt	1916	Keystone Steel & Wire Co.	Peoria, Ill.	GE
792	1190–875–525	350–250–150	2200	25	Merchant Mill	Direct-Rope	1925	Bethlehem Steel Co.	Lebanon, Pa.	GE
793	1200–1200	150–250	230	d.c.	12" Merchant Mill	Direct	1920	Timken Roller Bearing Co.	Canton, Ohio	GE
794	1200	200	2200	60	Piercing Mill	Rope	1919	Ohio Seamless Tube Co.	Shelby, Ohio	GE
795	1200	214	2200	25	84" Plate Mill	Geared	1913	Otis Steel Co.	Cleveland, Ohio	GE
796	1200	214	2200	25	Jobbing Sheet Mill	Geared	1913	Otis Steel Co.	Cleveland, Ohio	GE
797	1200	240	440	25	26" Sheet Mill	Rope	1907	Seneca Iron & Steel Co.	Buffalo, N. Y.	W
798	1200	240	2200	60	Sheet Mill	Geared	1915	Empire Rolling Mills	Cleveland, Ohio	GE
799	1200	240	2200	60	Sheet Mill	Geared	1916	Mahoning Valley Steel Co.	Niles, Ohio	GE
800	1200	240	2200	60	Sheet Mill	Geared	1916	United Alloy Steel Corp.	Canton, Ohio	GE
801	1200	240	2200	60	Sheet Mill	Geared	1917	United Alloy Steel Corp.	Canton, Ohio	GE
802	1200	240	2200	60	Sheet Mill	Geared	1920	Republic Iron & Steel Co.	Youngstown, Ohio	GE
803	1200	240	2200	60	Sheet Mill	Geared	1920	Republic Iron & Steel Co.	Youngstown, Ohio	GE
804	1200	240	2200	60	Hot Sheet Mill	Coupled	1915	Standard Tin Plate Co.	Canonsburg, Pa.	CW
805	1200	240	2200	60	Hot Sheet Mill	Coupled	1915	Standard Tin Plate Co.	Canonsburg, Oa.	CW
806	1200	240	2200	60	Hot Sheet Mill	Coupled	1915	Standard Tin Plate Co.	Canonsburg, Pa.	CW
807	1200	240	2200	60	Hot Sheet Mill	Coupled	1915	Standard Tin Plate Co.	Canonsburg, Pa.	CW
808	1200	240	2200	60	Hot Sheet Mill	Coupled	1915	Standard Tin Plate Co.	Canonsburg, Pa.	CW
809	1200	244	2200	25	Sheet Mill	Geared	1917	Bethlehem Steel Co.	Sparrows Pt., Md.	W
810	1200	244	2200	25	Sheet Mill	Geared	1917	Bethlehem Steel Co.	Sparrows Pt., Md.	W
811	1200	244	2200	25	Sheet Mill	Geared	1920	American Rolling Mills Co.	Middletown, Ohio	W
812	1200	244	2200	25	Sheet Mill	Geared	1920	American Rolling Mills Co.	Middletown, Ohio	W
813	1200	277	2200	60	Sheet Mill	Geared	1925	Wheeling Steel Corp.	Wheeling W. Va.	GE
814	1200	257	4600	60	Tube Mill	Rope & Coupled	1918	Detroit Seamless Tube Co.	Detroit, Mich.	AC
815	1200	292	2200	25	12" Continuous and 10" Merchant Mill	Direct & Rope	1912	Laclede Steel Co.	Alton, Ill.	W
816	1200	294	2200	60	Tube Rolling Mill	Geared	1915	National Tube Co.	Ellwood City, Pa.	W
817	1200	294	2200	60	Rolling Mill	Geared	1917	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind	W
818	1200	295	6600	60	Sheet Mill	Coupled	1922	Weirton Steel Co.	Weirton, W. Va.	AC
819	1200	295	6600	60	Sheet Mill	Coupled	1922	Weirton Steel Co.	Weirton, W. Va.	AC
820	1200–1150–800	300–214–150	2200	25	Merchant Mill, No.10	Geared	1916	Bethlehem Steel Co.	Lackawanna, N.Y.	GE
821	1200–1000–800	300–250–200	4400	25	14" Merchant Mill	Direct	1919	Buffalo Bolt Co.	N. Tonawanda, N. Y.	GE
822	1200	300	4100	60	Sheet Mill	Geared	1920	Chapman Price Steel Co.	Indianapolis, Ind.	GE
823	1200	300	2200	60	Sheet Mill	Geared	1920	Central Steel Co.	Massillon, Ohio	GE
824	1200	300	2200	60	Sheet Mill	Geared	1920	Central Steel Co.	Massillon, Ohio	GE
825	1200	300	2200	60	Sheet Mill	Geared	1924	Thomas Sheet Steel Co.	Niles, Ohio	GE
826	1200	300	2200	60	Sheet Mill	Geared	1924	Thomas Sheet Steel Co.	Niles, Ohio	GE

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
827	1200	300–500	600	d.c.	10″ Merchant Mill	Direct	1925	McKinney Steel Co.	Cleveland, Ohio	W
828	1200	352	2200	60	Sheet Mill	Rope	1917	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	W
829	1200	360	2200	60	Morgan Wire Rod Mill	Geared	1918	Interstate Iron & Steel Co.	Chicago, Ill.	AC
830	1200	360	2200	60	30″ Sheet Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	AC
831	1200	360	2200	60	24″ Bar Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	AC
832	1200	367	2200	25	Cold Rolling Mill	Geared	1917	Bethlehem Steel Co.	Sparrows Pt., Md.	W
833	1200	368	2200	50	20″ Merchant Mill	Geared	1919	Southern Calif. Iron & Steel Co.	Los Angeles, Cal.	W
834	1200	400	650	d.c.	Aluminum Plate Mill	Geared	1915	Aluminum Company of America	Niagara Falls, N. Y.	GE
835	1200–1000–800	450–375–300	6600	25	8″ Hoop Mill, No. 8	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
836	1200–1000–800	450–375–300	6600	25	8″ Hoop Mill, No. 9	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
837	1200–1000–800	450–275–300	6600	25	8″ Bar Mill, No. 16	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
838	1200–1200–1200	450–360–270	2300	60	9″ Hot Strip Mill	Geared	1916	Trumbull Steel Co.	Warren, Ohio	GE
839	1200–1200–1200	450–360–270	2300	60	9″ Hot Strip Mill	Geared	1916	Trumbull Steel Co.	Warren, Ohio	GE
840	1200–1200–1200	450–360–270	2300	60	9″ Hot Strip Mill	Direct	1916	Trumbull Steel Co.	Warren, Ohio	GE
841	1200–1000–800	450–375–300	6600	25	18″ Band Mill, No. 13	Geared	1919	Carnegie Steel Co.	Youngstown, Ohio	GE
842	1200	450	6600	60	Rail Mill Finishing Stand	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
843	1200	485	6400	25	12″ Merchant Mill	Geared	1916	American Steel & Wire Co.	Cleveland, Ohio	W
844	1200	500	2200	25	28″ Rail Mill	Geared	1914	Bethlehem Steel Co.	Steelton, Pa.	GE
845	1200	505–303	6600	60	16″ Band Mill	Geared	1919	Weirton Steel Co.	Weirton, W. Va.	W
846	1200	505	2200	60	29″ Bar (Roughing) Mill	Geared	1922	Youngstown Steel Co.	Youngstown, Ohio	W
847	1200	514	2200	60	Bar Mill	Geared	1917	Elyria Iron & Steel Co.	Elyria, Ohio	AC
848	1200	514	2200	60	Wire Rod Mill	Geared	1917	Kokomo Steel & Wire Co.	Kokomo, Ind.	AC
849	1200	590	2200	60	22″ Strip Mill	Geared	1919	Harrisburg Pipe & Pipe Bending Co.	Harrisburg, Pa.	W
850	1200	590	2200	60	24″ Blooming Mill	Geared	1919	McConway-Torley Co.	Pittsburgh, Pa.	W
851	1200	590–450	2200	60	Duo and Bull Head Mill	Geared	1916	Central Steel Co.	Massillon, Ohio	W
852	1200	590–407	2200	60	20″ Merchant (Roughing)	Geared	1918	Hoosier Rolling Mill Co.	Terre Haute, Ind.	W
853	1250	175–400	230	d.c.	Rod Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
854	1250–1250	175–350	600	d.c.	14″ Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
855	1250–1250	175–350	600	d.c.	14″ Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
856	1250	250	6600	25	Hot Tin Mill	Geared	1924	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
857	1250	250	6600	25	Hot Tin Mill	Geared	1924	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
858	1250	250	6600	25	Cold Tin Mill	Geared	1924	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
859	1250	294	6600	25	14″ Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
860	1250	300	6600	25	Steel Mill	Geared	1925	American Sheet & Tin Plate Co.	Wellsville, Ohio	AC
861	1250	375	2080	25	18″ Billet Mill	Geared	1918	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
862	1250	375	2080	25	18″ Billet Mill	Geared	1918	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
863	1250	375	2200	25	Merchants Bar Mill	Geared	1919	Valley Steel Co.	Milwaukee, Wis.	AC
864	1250–1000–650	650–500–325	2200	25	Rod Mill	Belt	1916	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
865	1250	712–430	6600	60	3 Stand 12″ Mill	Coupled	1921	Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
866	1300–900	214–140	2200	25	12″ Merchant Mill	Direct	1912	Gulf States Steel Co.	Birmingham, Ala.	GE
867	1300–1300	214–187	6600	25	10″ Merchant Mill	Geared	1916	Illinois Steel Co.	Gary, Ind.	GE
868	1300	360	2200	60	Wire Rod Mill	Coupled	1917	Kokomo Steel & Wire Co.	Kokomo, Ind.	AC
869	1300	500	6600	25	Rod (Finishing) Mill	Rope	1912	American Steel & Wire Co.	Birmingham, Ala.	W
870	1350	600	2300	60	Copper Mill	Geared	1918	American Brass Company	Waterbury, Conn.	GE
871	1400	240	2200	60	Sheet Mill	Geared	1912	Apollo Steel Co.	Apollo, Pa.	GE
872	1400	505	2200	60	14″ Billet Mill	Geared	1917	Wickwire Spencer Steel Corp.	Palmer, Mass.	W
873	1400–945	600–405	2200	60	21″ Merchant Mill	Geared	1915	Bourne-Fuller Co.	Cleveland, Ohio	GE
874	1500	50–80	600	d.c.	Cont. Merchant Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
875	1500	80	2200	60	Morgan Continuous Mill	Coupled	1920	Interstate Iron & Steel Co.	Chicago, Ill.	AC
876	1500	94	2200	25	18″ Merchant Mill	Direct	1910	Algoma Steel Co.	Sault Ste. Marie,Can.	GE
877	1500	100–125	220	d.c.	Light Rail Mill	Direct	1905	Carnegie Steel Co.	Bessemer, Pa.	W
878	1500	100–125	220	d.c.	Light Rail Mill	Direct	1905	Carnegie Steel Co.	Bessemer, Pa.	W
879	1500	100–150	600	d.c.	14″ Merchant Mill	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
880	1500	125–250	230	d.c.	14″ Band Mill	Direct	1914	Sharon Steel Hoop Co.	Sharon, Pa.	W
881	1500	125–250	240	d.c.	Strip Mill	Geared	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
882	1500	125–250	240	d.c.	Strip Mill	Geared	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
883	1500	133–81.5	6600	25	18″ Structural Mill	Direct	1915	Bethlehem Steel Co.	So. Bethlehem, Pa.	W
884	1500	150	6600	25	Wire Rod Mill	Coupled	1914	Illinois Steel Co.	Joliet, Ill.	AC
885	1500	150–300	230	d.c.	18–14″ Structural Mill	Direct	1924	Bethlehem Steel Co.	Johnstown, Pa.	AC
886	1500	150–300	230	d.c.	18–13″ Structural Mill	Direct	1924	Bethlehem Steel Co.	Johnstown, Pa.	AC
887	1500	182–162	6600	25	10″ Bar Mill	Direct & Rope	1913	Carnegie Steel Co.	Duquesne, Pa.	W
888	1500	187	2200	25	Sheet Mill	Chain	1914	National Enamel & Stamping Co.	Granite City, Ill.	AC
889	1500	200–400	600	d.c.	20″-16″ Hot Strip Mill	Geared	1925	Acme Steel Co.	Chicago, Ill.	W
890	1500	200–300	600	d.c.	10″ Merchant Mill	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
891	1500	210	2200	25	30″ Sheet Mill	Rope	1910	American Rolling Mill Co.	Middletown, Ohio	W
892	1500	218–145	6600	25	18″ Merchant Mill	Geared	1916	Carnegie Steel Co.	Duquesne, Pa.	W
893	1500	234	2200	60	Sheet Mill	Geared	1915	Canton Sheet & Steel Co.	Canton, Ohio	W
894	1500	234	2200	60	Sheet Mill	Geared	1916	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	W
895	1500	234	220	60	26″ Sheet Bar Mill	Geared	1916	Canton Sheet Steel Co.	Canton, Ohio	W
896	1500	234	2200	60	Sheet Mill	Geared	1917	Liberty Steel Co.	Warren, Ohio	W
897	1500	234	2200	60	Sheet Mill	Geared	1919	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	W
898	1500	234	2200	60	10″ Rod Mill	Geared	1921	Columbia Steel Co.	Pittsburgh, Cal.	W
899	1500	240	2200	60	Sheet Mill	Geared	1919	Follensbee Bros.	Toronto, Ohio	AC
900	1500	240	2200	60	Sheet Mill	Geared	1919	Follensbee Bros.	Toronto, Ohio	AC
901	1500	240	2200	60	Sheet Mill	?	1920	Canton Sheet Steel Co.	Canton, Ohio	AC
902	1500	240	2200	60	Sheet Mill	Geared	1922	United Alloy Steel Corp.	Canton, Ohio	GE
903	1500	250	2200	25	Sheet Mill	Geared	1919	Eastern Rolling Mills Co.	Baltimore, Md.	GE
904	1500	250	2200	25	Sheet Mill	Geared	1919	Eastern Rolling Mills Co.	Baltimore, Md.	GE
905	1500	257	2200	25	10″ Hot Strip Mill	Direct	1919	Superior Steel Co.	Carnegie, Pa.	GE
906	1500	270	2200	60	Sheet Mill	Geared	1914	Youngstown Sheet & Tube Co.	Warren, Ohio	W
907	1500	270	2200	60	24″ Sheet Bar & Billet Mill	Geared	1914	Central Steel Co.	Massillon, Ohio	W
908	1500	270	2200	60	Lamberton Rod Mill	Geared	1915	United Alloy Steel Corporation	Canton, Ohio	W
909	1500	270	2200	60	22″ Bar and Billet Mill	Geared	1918	Central Steel Co.	Massillon, Ohio	W
910	1500	277	2200		22″ Skelp Mill	Direct	1924	Bethlehem Steel Corp.	Coatesville, Pa.	GE
911	1500–1500	280–420	600	d.c.	20″ Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
912	1500–1500	280–420	600	d.c.	20″ Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
913	1500–1500	280–420	600	d.c.	20″ Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
914	1500	295	2200	60	Sheet Mill	Geared	1924	Kansas City Bolt & Nut Co.	Kansas City, Mo.	AC
915	1500	300	4600	25	Sheet Mill	Geared	1922	Michigan Steel Corp.	Detroit, Mich.	GE
916	1500	300	4600	60	Sheet Mill	Geared	1924	Michigan Steel Corp.	Detroit, Mich.	GE
917	1500–1250–875	300–250–175	2200	50	Merchant Mill	Direct	1925	Southern Calif. Iron & Steel Co.	Los Angeles, Cal.	GE
918	1500–1200–900	320–275–200	2200	60	10″ Merchant Mill	Geared	1925	Pacific Coast Steel Co.	So. San Fran., Cal.	GE
919	1500	355	2200	60	35″ Blooming Mill	Geared	1924	Timken Roller Bearing Co.	Canton, Ohio	AC
920	1500	360–240	6600	25	12″ Merchant Mill	Rope	1916	Carnegie Steel Co.	Duquesne, Pa.	W
921	1500	360	6400	25	Billet Mill	Geared	1916	American Steel & Wire Co.	Cleveland, Ohio	W
922	1500	360	2200	60	10″ Hot Strip Mill	Direct	1919	Superior Steel Co.	Carnegie, Pa.	GE
923	1500–1250–1000	360–300–240	2200	25	28″ Rail Mill	Geared	1920	Bethlehem Steel Co.	Steelton, Pa.	GE
924	1500	360	4000	60	Sheet Mill	Geared	1923	Metal & Thermit Corp.	So.San Francisco,Cal.	GE
925	1500	360	2200	60	Sheet Mill	Geared	1923	Columbia Steel Co.	Pittsburgh, Cal.	GE
926	1500	368	2200	25	Sheet Bar (Finishing) Mill	Geared	1923	Inland Steel Co.	Chicago, Ill.	W
927	1500–1125	375–281	2200	25	10″ Merchant Mill	Geared	1916	Donner Steel Co.	Buffalo, N. Y.	GE
928	1500	375	2200	25	26″ 3 high Blooming Mill	Geared	1920	Atlas Crucible Steel Co.	Dunkirk, N. Y.	GE
929	1500	440	2200	60	22″ Bar Mill	Geared	1919	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
930	1500	450	2200	30	3 High Skelp Mill	Geared	1915	Spang Chalfant Co.	Etna, Pa.	GE
931	1500–1200–1500	450–360–270	2300	60	16″ Strip Mill	Geared	1916	Trumbull Steel Co.	Warren, Ohio	GE
932	1500	450	2200	60	Roughing Mill	Geared	1919	Pacific Coast Steel Co.	San Francisco, Calif.	AC
933	1500	450	2200	60	Bar Mill	Rope	1919	Pacific Coast Steel Co.	Seattle, Wash.	AC
934	1500	450–550	600	d.c.	Rod Mills Nos. 16, 18	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
935	1500–1200–900	468–375–281	6600	25	12″ Strip Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
936	1500	470–510	230	d.c.	Rod Mill	Direct	1923	John A. Roebling Sons	New York, N. Y.	W

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
937	1500	491	6600	25	14" Cont. Skelp Mill	Geared	1924	Gary Tube Co.	Gary, Ind.	AC
938	1500	505	6600	60	16" Hoop and Band Mill	Geared	1915	Weirton Steel Co.	Weirton, W. Va.	W
939	1500	257-508	6600	60		Coupled	1924	Weirton Steel Co.	Weirton, W. Va.	AC
940	1500	508	6600	60	Steel Mill	Geared	1924	Weirton Steel Co.	Weirton, W. Va.	AC
941	1500	514	2200	60	Wire Rod Mill	Coupled	1917	Kokomo Steel & Wire Co.	Kokomo, Ind.	AC
942	1500	514	6600	60	Hot Strip Mill	Geared	1917	Weirton Steel Co.	Weirton, W. Va.	AC
943	1500-1500	514-237	6600	60	Hot Strip Mill	Geared	1917	Weirton Steel Co.	Weirton, W. Va.	AC
944	1500	593	6600	60	6 Stand 11" Mill	Coupled	1921	Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
945	1500	600	2200	60	Light Rail Mill	Geared	1919	West Virginia Rail Co.	Huntington, W. Va.	AC
946	1500	705	2200	60	Strip Mill	Geared	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
947	1500	705	2200	60	Srtip Mill	Geared	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
948	1500	705	2200	60	24" Bar (Finishing) Mill	Geared	1922	Youngstown Steel Co.	Youngstown, Ohio	W
949	1500	705	2200	60		Coupled	1923	Bethlehem Steel Corp.	Coatesville, Pa.	AC
950	1500	705	2200	60	22" Bar Mill	Geared	1924	Atchison, Topeka & Sante Fe Ry.	San Francisco, Cal.	AC
951	1500	705	2200	60	20"-16" Hot Strip Mill	Geared	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
952	1500	735	2200	25		Geared	1923	Scullin Steel Co.	St. Louis, Mo.	AC
953	1500	890-540	6600	60	4 Stand 12" Mill	Coupled	1921	Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
954	1600	94	2200	25	Sheet Mill	Rope	1910	American Sheet & Tin Plate Co.	Gary, Ind.	GE
955	1660	94	2200	25	Sheet Mill	Rope	1910	American Sheet & Tin Plate Co.	Gary, Ind.	GE
956	1600	94	2200	25	Sheet Mill	Rope	1913	American Sheet & Tin Plate Co.	Gary, Ind.	GE
957	1600	94	2200	25	Sheet Mill	Rope	1913	American Sheet & Tin Plate Co.	Gary, Ind.	GE
958	1600	94	2200	25	Tin Mill	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
959	1600	94	2200	25	Tin Mill	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
960	1600	94	2200	25	Tin Mill	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
961	1600	94	2200	25	Tin Mill	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
962	1600	150	6600	25		Direct	1912	Pittsburgh Crucible Steel Co.	Pittsburgh, Pa.	GE
963	1600	210	2200	25	Sheet Mill	Geared	1912	Inland Steel Co.	Indiana Harbor, Ind.	W
964	1600	210-420	525	d.c.	Rod Mill	Geared	1913	Steel Company of Canada	Hamilton, Ont.	W
965	1600	210-420	525	d.c.	Rod Mill	Geared	1913	Steel Company of Canada	Hamilton, Ont.	W
966	1600	214	2200	25	84" Plate Mill	Geared	1913	Otis Steel Co.	Cleveland, Ohio	GE
967	1600	240	2200	60	Sheet Mill	Geared	1919	Falcon Steel Co.	Niles, Ohio	GE
968	1600	244	2200	25	84" Plate Mill (Roughing)	Geared	1912	Alan Wood Iron & Steel Co.	Ivy Rock, Pa.	W
969	1600	244	2200	25	84" Plate Mill (Finishing)	Geared	1912	Alan Wood Iron & Steel Co.	Ivy Rock, Pa.	W
970	1600	250	440	25	Sheet Mill	Geared	1914	Seneca Iron & Steel Co.	Buffalo, N. Y.	GE
971	1600	257	2200	60	14" Cont. Billet Mill	Geared	1912	Atlantic Steel Co.	Atlanta, Ga.	GE
972	1600	270	2200	60	Sheet Mill	Geared	1916	Wheeling Steel Corporation	Wheeling, W. Va.	W
973	1600	270	2200	60	Sheet Mill	Geared	1916	Wheeling Steel Corporation	Portsmouth, Ohio	W
974	1600	280	2200	60	Continuous Billet Mill	Geared	1913	Steel Company of Canada	Hamilton, Ont.	W
975	1600	500	6600	25	Rod (Finishing) Mill	Rope	1910	American Steel & Wire Co.	Birmingham, Ala.	W
976	1600	490	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
977	1600	140-490-540	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
978	1600	140-490-540	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
979	1600	600	2200	60	Piercing Mill	Geared	1921	Standard Seamless Tube Co.	Pittsburgh, Pa.	GE
980	1650-1500-1350	413-375-337	6600	25	10" Bar Mill, No. 10	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
981	1700-1700	90-140	600	d.c.	14" Continuous Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
982	1700-1700	90-205	600	d.c.	14" Continuous Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
983	1700	214	2200	25	Sheet Mill	Geared	1915	American Sheet & Tin Plate Co.	Gary, Ind.	GE
984	1700	214	2200	25	Tin Mill	Geared	1915	American Sheet & Tin Plate Co.	Gary, Ind.	GE
985	1700	214	2200	25	Tin Mill	Geared	1915	American Sheet & Tin Plate Co.	Gary, Ind.	GE
986	1700	214	2200	25	Tin Mill	Geared	1918	American Sheet & Tin Plate Co.	Gary, Ind.	GE
987	1700	214	2200	25	Tin Mill	Geared	1918	American Sheet & Tin Plate Co.	Gary, Ind.	GE
988	1700	214	2200	25	Tin Mill	Geared	1918	American Sheet & Tin Plate Co.	Gary, Ind.	GE
989	1700	214	2200	25	Tin Mill	Geared	1919	American Sheet & Tin Plate Co.	Gary, Ind.	GE
990	1700	250	440	25	Hot Sheet Mill	Geared	1925	Seneca Iron & Steel Co.	Buffalo, N. Y.	GE
991	1700	250-500	250	d.c.	12-10" Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
992	1750	70-120	600	d.c.	29" Billet Mill	Direct	1916	Youngsto wnSteel & Tube Co.	Indiana Harbor, Ind.	W
993	1750	150-300	230	d.c.	18-14" Structural Mill	Direct	1924	Bethlehem Steel Corp.	Lackawanna, N. Y.	AC
994	1800	40	600	d.c.	84" Sheared Plate Mill	Direct	1917	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
995	1800	75	6600	25	30" Billet Mill	Direct	1914	Bethlehem Steel Co.	Bethlehem, Pa.	GE
996	1800-1800	115-230	600	d.c.	20" Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
997	1800-1800	115-230	600	d.c.	20" Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
998	1800-1800	115-230	600	d.c.	20" Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
999	1800	120-80	2200	25	Light Rail Mill	Direct	1905	Illinois Steel Co.	South Chicago, Ill.	W
1000	1800	120-80	2200	25	Light Rail Mill	Direct	1905	Illinois Steel Co.	South Chicago, Ill.	W
1001	1800	125-250	600	d.c.	20"-16" Hot Strip Mill	Direct	1925	Acme Steel Co.	Chicago, Ill.	W
1002	1800	125-250	600	d.c.	20"-16" Hot Strip Mill	Direct	1925	Acme Steel Co.	Chicago, Ill.	W
1003	1800	165-350	240	d.c.	Strip Mill	Direct	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
1004	1800	165-350	240	d.c.	Strip Mill	Direct	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
1005	1800	185-370	600	d.c.	20"-16" Hot Strip Mill	Geared	1925	Acme Steel Co.	Chicago, Ill.	W
1006	1800	185-370	600	d.c.	20"-16" Hot Strip Mill	Direct	1925	Acme Steel Co.	Chicago, Ill.	W
1007	1800	185-370	600	d.c.	20"-16" Hot Strip Mill	Direct	1925	Acme Steel Co.	Chicago, Ill.	W
1008	1800	200-400	600	d.c.	Cont. Merchant Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
1009	1800	214	2200	25	6" Hot Strip Mill	Rope	1907	American Steel & Wire Co.	Cleveland, Ohio	GE
1010	1800	235	2200	60	Sheet Mill	Geared	1915	Trumbull Steel Co.	Warren, Ohio	W
1011	1800-1500-1200	240-200-160	2300	60	10" Hoop Mill	Belt	1918	Acme Steel Good Co.	Riverdale, Ill.	GE
1012	1800	240	2200	60	Sheet Mill	Geared	1920	Apollo Steel Co.	Apollo, Pa.	GE
1013	1800-1800	250-125	6600	25	22" Merchant Mill	Geared	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
1014	1800	250	2200	60	Tube Rolling Mill	Direct	1915	National Tube Co.	Ellwood City, Pa.	W
1015	1800	252	2200	60	Tube Rolling Mill	Direct	1925	National Tube Co.	Ellwood City, Pa.	W
1016	1800	253	2200	60	Eight Stand Tin Mill	Coupled	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	AC
1017	1800	270	6600	60	Sheet Mill	Geared	1916	Andrews Steel Co.	Newport, Ky.	W
1018	1800	270	6600	60	Sheet Mill	Geared	1916	Andrews Steel Co.	Newport, Ky.	W
1019	1800	366	2200	25	22" Billet & Struct. Mill	Geared	1919	Scullin Steel Co.	St. Louis, Mo.	W
1020	1800-1800-1800	370-300-247	6600	60	Sheet Bar Mill	Geared	1920	American Rolling Mill Co.	Ashland, Ky.	GE
1021	1800-1500-1200	450-375-300	6600	25	10" Hoop Mill, No. 11	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
1022	1800	500	6600	25	20" Hot Strip Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	GE
1023	1800	514	2200	60	Rod Mill	Geared	1923	Columbia Steel Co.	Pittsburgh, Cal.	GE
1024	1800	550-650	250	d.c.	22" Merchant Mill	Geared	1925	Crucible Steel Co.	Pittsburgh, Pa.	GE
1025	1850-1450-925	120-94-60	6600	25	16" Hand Bar Mill	Direct	1921	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
1026	1850	575-221	600	d.c.	Rod Mill	Direct & Belt	1922	Atlantic Steel Co.	Atlanta, Ga.	W
1027	2000	50-100	600	d.c.	30" Bar Mill	Direct	1919	Follansbee Brothers Co.	Toronto, Ohio	W
1028	2000	68	6600	25	28" Rail Mill	Direct	1906	Illinois Steel Co.	Gary, Ind.	GE
1029	2000	75	2200	25	Blooming Mill	Direct	1916	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
1030	2000	83	6600	25	96" Plate Mill	Coupled	1918	Youngstown Sheet & Tube Co.	Youngstown, Ohio	AC
1031	2000	83	6600	25	84" Plate Mill	Coupled	1918	Youngstown Sheet & Tube Co.	Youngstown, Ohio	AC
1032	2000	85-165	600	l.c.	21" Cont. Sheet Bar and Skelp Mill	Direct	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
1033	2000	85-165	600	l.c.	21" Cont. Sheet Bar and Skelp Mill	Direct	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
1034	2000	85-165	600	l.c.	21" Cont. Sheet Bar and Skelp Mill	Direct	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
1035	2000	94	2200	25	18" Merchant Mill	Direct	1912	Forged Steel Wheel Co.	Butler, Pa.	GE
1036	2000-2000-2000	100-83.3-65	6600	25	12" Structural Mill	Direct	1916	Bethlehem Steel Co.	Bethlehem, Pa.	GE
1037	2000	113	6600	25	12" Merchant Mill	Direct	1909	Illinois Steel Co.	Gary, Ind.	W
1038	2000	134-275	600	d.c.	10" Merchant Mill	Direct	1925	McKinney Steel Co.	Cleveland, Ohio	W
1039	2000	163-113	6600	25	10" Merchant Mill	Direct	1909	Illinois Steel Co.	Gary, Ind.	W
1040	2000-1700	210-680	600	d.c.	14" Continuous Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
1041	2000	214	6600	25	40" Rail Mill	Geared	1906	Illinois Steel Co.	Gary, Ind.	GE
1042	2000	214	6600	25	40" Rail Mill	Geared	1906	Illinois Steel Co.	Gary, Ibd.	GE
1043	2000	214	6600	25	40" Billet Mill	Geared	1907	Illinois Steel Co.	Gary, Ind.	GE

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1044	2000	214	6600	25	40" Billet Mill	Geared	1907	Illinois Steel Co.	Gary, Ind.	GE
1045	2000	214	2200	25	Jobbing Plate Mill	Geared	1925	Otis Steel Co.	Cleveland, Ohio	GE
1046	2000	230-460	600	d.c.	Merchant Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
1047	2000	230-460	600	d.c.	Merchant Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
1048	2000	230-460	600	d.c.	Merchant Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
104	2000	234-161	2200	60	10" Skelp (Finishing) Mil	Belt	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
1050	2000	234	2200	60	Sheet Mill	Geared	1919	Newton Steel Co.	Newton Falls, Ohio	W
1051	2000	234	2200	60	Tin Mill	Geared	1920	National Enam. & Stamping Co.	St. Louis, Mo.	W
1052	2000	234	2200	60	Sheet Mill	Geared	1921	Newton Steel Co.	Newton Falls, Ohio	W
1053	2000	234	2200	60	Sheet Mill	Geared	1923	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
1054	2000	240	2200	60	32" Blooming Mill	Geared	1915	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	GE
1055	2000	240	2200	60	18" Sheet Bar Mill	Geared	1920	National Enam. & Stamping Co.	Granite City, Ill.	GE
1056	2000	240	2200	60	Sheet Mill	Geared	1919	Republic Iron & Steel Co.	Niles, Ohio	GE
1057	2000	244	2200	25	90" Plate Mill	Rope	1912	Inland Steel Co.	Indiana Harbor, Ind.	W
1058	2000	250-150	2200	60	Morgan Continuous Mill	Coupled		Interstate Iron & Steel Co.	Chicago, Ill.	AC
1059	2000-2000	250-161	6600	25	10" Skelp Mill	Geared	1915	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
1060	2000	250	6600	25	Sheet Mill	Geared	1920	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
1061	2000	250	6600	25	Sheet Mill	Geared	1920	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
1062	2000	260-800	600	d.c.	14" Continuous Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
1063	2000	294	6600	25	14" Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
1064	2000	350-234	2200	60	10" Skelp (Roughing) Mill	Geared	1917	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
1065	2000	375	2200	25	84" Plate Mill	Geared	1916	Donner Steel Co.	Buffalo, N. Y.	GE
1066	2000	375	2200	25	Wheel Mill	Geared	1916	Bethlehem Steel Co.	Johnstown, Pa.	AC
1067	2000-2000-1600	450-360-270	2200	60	16" Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
1068	2000-2000-1600	450-360-270	2200	60	16" Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
1069	2000-2000-1600	450-360-270	2200	60	16" Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
1070	2000	450	6500	60	Rail Mill Roughing Stand	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
1071	2000	505	6600	60	Plate Mill	Geared	1922	American Rolling Mills Co.	Ashland, Ky.	W
1072	2000	505	6600	60	Plate Mill	Geared	1922	American Rolling Mills Co.	Ashland, Ky.	W
1073	2000	600	6600	60	Sheet Mill	Geared	1924	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
1074	2000	600	6600	60	Fin. Stand of 24" Struc. Mill	Geared	1924	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
1075	2000	600	6600	60		Geared	1925	Tenn. Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
1076	2000-1600-1200	625-500-375	6600	25	12" Strip Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
1077	2000-1600-1200	625-500-375	6600	25	14" Bar Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
1078	2070-1650-1205	235-187.5-137	6600	25	20" Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
1079	2100	50-125	700	d.c.	42" Universal Plate Mill	Direct	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
1080	2100	47-120	700	d.c.	34" Blooming Mill	Direct	1916	Penn Seaboard Steel Corporation	New Castle, Del.	W
1081	2100-2100	150-310	600	d.c.	14" Continuous Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
1082	2100-1600	150-460	600	d.c.	14" Continuous Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
1083	2200	50-120	600	d.c.	40" Universal Plate Mill	Direct	1919	Dominion Foundrys & Steel Co.	Hamilton, Ont.	W
1084	2200	70-150	600	d.c.	28" Blooming Mill	Direct	1920	Atlantic Steel Co.	Atlanta, Ga.	W
1085	2200-2000-1800	275-250-225	6600	25	10" Bar Mill, No. 15	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
1086	2200-2000-1800	275-250-225	6600	25	18" Band Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio,	GE
1087	2200	505-303	2200	60	18" Bar (Finishing) Mill	Geared	1919	Central Steel Co.	Massillon, Ohio	W
1088	2300-1300	115.4-65	6600	25	10" Skelp Mill	Geared	1915	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
1089	2360-1880-1440	410-327-250	2200	60	Rod Mill	Geared	1916	Keystone Steel & Wire Co.	Peoria, Ill.	GE
1090	2400	500	6600	25	Wire Rod Mill	Geared	1916	Illinois Steel Co.	Gary, Ind.	AC
1091	2470-1725-1235	430-300-215	2200	25	Rod Mill	Geared	1916	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
1092	2500	82	6600	60	28" Structural Mill	Direct	1917	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
1093	2500	113-91	6600	25	12" Merchant Mill	Geared	1909	Illinois Steel Co.	Gary, Ind.	W
1094	2500	146	6600	25	16" Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
1095	2500	150	6600	25	28" Billet Mill	Geared	1923	Pittsburgh Crucible Steel Co.	Midland, Pa.	GE
1096	2500	184	6600	25	Skelp Mill	Rope	1908	National Tube Co.	Lorain, Ohio	W
1097	2500	184	6600	25	Skelp Mill	Rope	1908	National Tube Co.	Lorain, Ohio	W
1098	2500	187½	6600	25	18" Band Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
1099	2500	187½	6600	25	18" Band Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
1100	2500	235	2200	60	84" Plate (Finishing) Mil	Geared	1917	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
1101	2500	240	2200	60	Sheet Mill	Geared	1919	Wheeling Steel Corp.	Steubenville, Ohio	GE
1102	2500	240	2200	60	24" Sheet Bar Mill	Geared	1920	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	GE
1103	2500	247	6600	25	Piercing Mill	Geared	1923	Gary Tube Co.	Gary, Ind.	W
1104	2500	247	6600	25	Seamless Tube Mill	Geared	1925	Gary Tube Company	Gary, Ind.	W
1105	2500	252	2200	60	Skelp Mill	Geared	1917	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
1106	2500	252	2200	60	Skelp Mill	Geared	1917	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
1107	2500	257	2200	60	Piercing Mill	Geared	1925	Globe Steel Tube Co.	Milwaukee, Wis.	AC
1108	2500	295	6600	25	16" Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
1109	2500	300	2200	25	Sheet Mill	Geared	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
1110	2500	352-167	6600	60	16" Hoop and Band Mill	Geared	1915	Weirton Steel Co.	Weirton, W. Va.	W
1111	2500	500	2200	60	22" Bar Mill	Geared	1923	Phoenix Iron Co.	Phoenixville, Pa.	W
1112	2600	81.5	6600	25	Rod (Roughing) Mill	Geared	1910	American Steel & Wire Co.	Birmingham, Ala.	W
1113	2600	368	6400	25	Rod Mill	Geared	1916	American Steel & Wire Co.	Cleveland, Ohio	W
1114	2750-2240-1750	262-214-167	6600	25	12" Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
1115	2750-2500-2250	275-250-225	6600	25	14" Bar Mill, No. 14	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
1116	2870-1435	400-200	600	d.c.	10" Rod Mill	Geared	1922	Wheeling Steel Corp.	Portsmouth, Ohio	GE
1117	2900	47-120	700	d.c.	34" Blooming Mill	Direct	1917	Sharon Steel Hoop Co.	Youngstown, Ohio	W
1118	3000	40-100	600	d.c.	Seamless Tube Mill	Direct	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
1119	3000	70-150	750	d.c.	24" Reversing Bar Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
1120	3000	91	2200	25	Struct. (Roughing) Mill	Geared	1910	Illinois Steel Co.	South Chicago, Ill.	W
1121	3000	125	6400	25	20" Flat Mill	Coupled	1916	American Steel & Wire Co.	Cleveland, Ohio	AC
1122	3000	125-200	600	d.c.	Seamless Tube Mill	Direct	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
1123	3000	150	6600	25	Wire Rod Mill	Coupled	1920	Minnesota Steel Co.	Steelton, Minn.	AC
1124	3000	150-300	230	d.c.	18"14" Structural Mill	Direct	1924	Bethlehem Steel Co.	Johnstown, Pa.	AC
1125	3000	150-300	230	d.c.	18-13" Structural Mill	Direct	1924	Bethlehem Steel Co.	Johnstown, Pa.	AC
1126	3000-3000-3000	155-144-130	6600	60	24" Structural Mill	Direct	1917	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
1127	3000	184	6600	25	16" Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
1128	3000-3000	200-360	600	d.c.	14" Continuous Mill	Geared	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
1129	3000	209	6600	25	12" & 16" Merchant Mill	Geared	1913	Minnesota Steel Co.	Duluth, Minn.	W
1130	3000	235	2200	60	100" Plate Mill	Geared	1922	National Enam. & Stamping Co.	St. Louis, Mo.	W
1131	3000	245	2200	25	90" Plate Mill	Geared	1920	Inland Steel Co.	Indiana Harbor, Ind.	W
1132	3000	250	6600	25	18" Cont. Billet Mill	Geared	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
1133	3000-2500-2000	300-250-200	6600	25	18" Band Mill, No. 13	Direct	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
1134	3000-2500-2000	300-250-200	6600	25	12" Hoop Mill, No. 12	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
1135	3000	325-485	600	d.c.	24" Structural Mill	Geared	1923	Phoenix Iron Co.	Phoenixville, Pa.	W
1136	3000	354-212	2200	60	Skelp Mill	Geared	1920	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
1137	3000	360	6600	60	28" Rail Mill	Geared	1919	Dominion Iron & Steel Co.	Sydney, N. S.	GE
1138	3000	375	2200	25	14" Merchant Mill	Geared	1916	Donner Steel Co.	Buffalo, N. Y.	GE
1139	3000	375	2200	25	18" Billet Mill	Geared	1916	Donner Steel Co.	Buffalo, N. Y.	GE
1140	3000	375	6600	25	24" Sheet Bar Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	GE
1141	3000	450	6600	60	Rod Mills No. 1 to No. 6	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
1142	3000	450	6600	60	Rod Mills No. 10 to No. 15	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
1143	3000	450	6600	60	Rail Mill, Intermediate Stand	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
1144	3000	500	6600	25	26" Rail Mill	Geared	1924	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
1145	3000	500	6600	25	26" Rail Mill	Geared	1924	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
1146	3000	505-300	2200	60	12" Merchant Mill	Geared	1920	United Alloy Steel Corporation	Canton, Ohio	W
1147	3100	70-150	600	d.c.	Universal Plate Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
1148	3200	50-120	700	d.c.	34" Struct. (Rough). Mill	Direct	1915	Inland Steel Co.	Indiana Harbor, Ind.	W
1149	3200	50-120	700	d.c.	28" Struct. (Fin.) Mill	Direct	1915	Inland Steel Co.	Indiana Harbor, Ind.	W
1150	3200	91	6600	25	18" Merchant Mill	Geared	1909	Illinois Steel Co.	Gary, Ind.	W
1151	3200	91	6600	25	14" Merchant Mill	Geared	1909	Illinois Steel Co.	Gary, Ind.	W

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1152	3250	40	500	d.c.	36" Blooming Mill	Direct	1916	American Rolling Mill Co.	Ashland, Ky.	GE
1153	3250	40	500	d.c.	34" Blooming Mill	Direct	1916	Keystone Steel & Wire Co.	Peoria, Ill.	GE
1154	3250	94	6600	25	18" Sheet Bar Mill	Direct	1916	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
1155	3500	50–120	700	d.c.	34" Blooming Mill	Direct	1925	Kokomo Steel & Wire Co.	Kokomo, Ind.	W
1156	3500	50–120	700	d.c.	36" Blooming Mill	Direct	1925	Phoenix Iron Co.	Phoenixville, Pa.	W
1157	3500	50–100	650	d.c.	Rail Mill	Direct	1925	Bethlehem Steel Co.	Steelton, Pa.	GE
1158	3500	70–100	525	d.c.	32" Blooming Mill	Direct	1913	Steel Company of Canada	Hamilton, Ont.	W
1159	3500	50–75	700	d.c.	34" Blooming Mill	Direct	1914	Central Steel Co.	Massillon, Ohio	W
1160	3500	50–120	700	d.c.	35"–Structural Mill	Direct	1924	Bethlehem Steel Co.	Lackawanna, N. Y.	W
1161	3500	92	2200	60	18" Sheet Bar Mill	Direct	1916	Trumbull Steel Co.	Warren, Ohio	GE
1162	3500	92	2200	60	21" Sheet Bar Mill	Direct	1918	Trumbull Steel Co.	Warren, Ohio	GE
1163	3500	150–300	230	d.c.	18–14" Structural Mill	Direct	1924	Bethlehem Steel Co.	Lackawanna, N. Y.	AC
1164	3500	600	2200	60	Piercing Mill	Geared	1925	Standard Seamless Tube Co.	Economy, Pa.	GE
1165	3600	40–90	600	d.c.	35" Blooming Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	W
1166	3600	40–90	600	d.c.	40" Blooming Mill	Direct	1917	Illinois Steel Co.	Gary, Ind.	W
1167	3600–1940	290–156	2200	60	21" Cont. Sheet Bar and Skelp Mill	Geared	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
1168	3750	500	2200	60	112" 3-High Plate Mill	Geared	1925	Lukens Steel Company	Coatesville, Pa.	W
1169	4000	0–150	575	d.c.	36" Universal Plate Mill	Direct	1905	Illinois Steel Co.	South Chicago, Ill.	W
1170	4000	50–120	700	d.c.	34" Blooming Mill	Direct	1924	Donner Steel Co.	Buffalo, N. Y.	GE
1171	4000	80	600	d.c.	30" Universal Skelp Mill	Direct	1922	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
1172	4000	0 80	1200	d.c.	34" Blooming Mill	Coupled	1912	Algoma Steel Co.	Saulte Ste. Marie, Can.	AC
1173	4000	82	6600	60	110" Plate Mill	Direct	1917	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
1174	4000	82	6600	60	110" Plate Mill	Direct	1918	Dominion Iron & Steel Corp.	Sydney, N. S.	GE
1175	4000	83	6600	25 cy.	110" Plate Mill	Direct	1916	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
1176	4000	83	6600	25 cy.	24" Cont. Billet Mill	Direct	1916	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
1177	4000	83	6600	25 cy.	110" Plate Mill	Direct	1917	Carnegie Steel Co.	Homestead, Pa.	GE
1178	4000	83	6600	60 cy.	33" Structural Mill	Direct	1920	Carnegie Steel Co.	Homestead, Pa.	GE
1179	4000	93	6600	60 cy.	18" Continuous Bar Mill	Direct	1919	Weirton Steel Co.	Weirton, W. Va.	W
1180	4000	93	6600	60 cy.	21" Continuous Bar Mill	Direct	1919	Weirton Steel Co.	Weirton, W. Va.	W
1181	4000	147	6600	25 cy.	20" Merchant Mill	Geared	1916	Illinois Steel Co.	Gary, Ind.	W
1182	4000	200	6600	60 cy.	120" Plate Mill	Geared	1920	Worth Steel Co.	Claymont, Del.	GE
1183	4000	360	2200	60 cy.	21" Sheet Bar Mill	Geared	1917	Sharon Steel Hoop Co.	Lowellville, Ohio	GE
1184	4000	375	6600	25	Rail Mill	Geared	1925	Bethlehem Steel Co.	Steelton, Pa.	GE
1185	4000	375	6600	25	10" Cont. Wire Rod Mill	Geared	1925	Bethlehem Steel Co.	Sparrows Point, Md.	GE
1186	4200	93	2200	60 cy.	Continuous Bar Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
1187	4500–4500	67 5–110	500	d.c.	14" Merchant Mill	Geared	1923	Ford Motor Co.	Detroit, Mich.	GE
1188	4500	120–255	750	d.c.	Univ. Skelp Mill	Coupled	1925	Gary Tube Co.	Gary, Ind.	AC
1189	4500–4500	500–300	2200	25 cy.	14" Merchant Mill	Geared	1923	Inland Steel Co.	Indiana Harbor, Ind.	GE
1190	5000	40–120	600	d.c.	40" Blooming Mill	Direct	1916	National Tube Co.	Lorain, Ohio	W
1191	5000	40–120	600	d.c.	35" Blooming Mill	Direct	1916	Youngstown Sheet & Tube	Indiana Harbor, Ind.	W
1192	5000	40–120	600	d.c.	35" Blooming Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
1193	5000	50–120	700	d.c.	36" Rev. Rougher Mill	Direct	1924	Carnegie Steel Co.	Homestead, Pa.	W
1194	5000	75–120	700	d.c.	48" Universal Plate Mill	Direct	1923	Bethlehem Steel Co.	Lackawanna, N. Y.	W
1195	5000	75–150	700	d.c.	28" Structural Mill	Direct	1924	Bethlehem Steel Corp.	Lackawanna, N. Y.	W
1196	5000	99	13200	60	18" Billet Mill	Direct	1925	Ford Motor Company	Detroit, Mich.	W
1197	5000	197	2200	60 cy.	132" Plate Mill	Geared	1917	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
1198	5000	370	6600	25 cy.	132" Plate Mill	Geared	1923	Illinois Steel Co.	South Chicago, Ill.	W
1199	5000	370	6600	25 cy.	90" Plate Mill	Geared	1923	Illinois Steel Co.	South Chicago, Ill.	W
1200	5000	450	2300	60 cy.	18" Continuous Sheet Bar and Billet Mill	Geared	1919	Wheeling Steel Corporation	Portsmouth, Ohio	GE
1201	5000–4000–3000	450–360–270	2200	60	16" Hot Strip Mill	Geared	1925	Trumbull Steel Co.	Warren, Ohio	GE
1202	5000	595	6600	60 cy.	28" 3 Stand Rail	Coupled	1921	Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
1203	5000	594	6600	60 cy.	Sheet & Billet Mill	Geared	1924	Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	GE
1204	5500–4400–3400	170–136–105	6600	25 cy.	20" Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
1205	5500	370	6600	25 cy.	16" Cont. Skelp Mill	Geared	1924	Gary Tube Co.	Gary, Ind.	AC
1206	5750	94	6600	25 cy.	21" Cont. Billet Mill	Direct	1914	McKinney Steel Co.	Cleveland, Ohio	GE
1207	5750	94	6600	25 cy.	18" Bar Mill	Direct	1915	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
1208	5750	94	6600	25 cy.	21" Bar Mill	Direct	1921	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
1209	5750	94	6600	25 cy.	18" Billet Mill	Geared	1923	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
1210	5750	94	6600	25 cy.	21" Billet Mill	Geared	1923	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
1211	6000	40–120	600	d.c.	44" Blooming Mill	Direct	1919	Bethlehem Steel Co.	Steelton, Pa.	W
1212	6000	75	6600	25 cy.	40" Rail Mill	Direct	1906	Illinois Steel Co.	Gary, Ind.	GE
1213	6000	82	6600	25 cy.	28" Rail Mill	Geared	1914	Minnesota Steel Co.	Duluth, Minn.	W
1214	6000	83	6600	25 cy.	28" Rail Mill	Direct	1906	Illinois Steel Co.	Gary, Ind.	GE
1215	6000	83	6600	25 cy.	32" Billet Mill	Direct	1907	Illinois Steel Co.	Gary, Ind.	GE
1216	6000	83	6600	25 cy.	24" Billet Mill	Direct	1907	Illinois Steel Co.	Gary, Ind.	GE
1217	6000	83	6600	25 cy.	18" Billet Mill	Direct	1907	Illinois Steel Co.	Gary, Ind.	GE
1218	6000	83	6600	25 cy.	18" Sheet Bar Mill	Direct	1910	Illinois Steel Co.	Gary, Ind.	GE
1219	6000	88	6600	25 cy.	28" Rail Mill	Direct	1906	Illinois Steel Co.	Gary, Ind.	GE
1220	6000	98	6600	25 cy.	28"–32" Structural Mill	Direct	1924	Carnegie Steel Co.	Homestead, Pa.	W
1221	6250	368	2200	25 cy.	24" Cont. Billet Mill	Geared	1922	Inland Steel Co.	Indiana Harbor, Ind.	W
1222	6500	40–120	600	d.c.	40" Blooming Mill	Direct	1915	Inland Steel Co.	Indiana Harbor, Ind.	W
1223	6500	50	600	d.c.	36" Blooming Mill	Direct	1916	Trumbull Steel Co.	Warren, Ohio	GE
1224	6500	50	600	d.c.	40" Blooming Mill	Direct	1916	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
1225	6500	50	600	d.c.	40" Blooming Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
1226	6500–4500	107–53	6600	25 cy.	60" 3 High Universal Plate Mill	Direct	1909	Illinois Steel Co.	Gary, Ind.	GE
1227	7000	40–120	700	d.c.	Blooming Mill	Coupled	1925	Illinois Steel Co.	South Chicago, Ill.	AC
1228	7000	0–50–120	700	d.c.	44" Blooming Mill	Direct	1924	Carnegie Steel Co.	Homestead, Pa.	W
1229	7000	50–120	700	d.c.	40" Rev. Blooming Mill	Direct	1923	Bethlehem Steel Co.	Lackawanna, N. Y.	W
1230	7000	50–120	700	d.c.	40" Blooming Mill	Direct	1924	International Harvester Co.	Chicago, Ill.	W
1231	7000	50–120	700	d.c.	36" Rev. Rougher Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	W
1232	7000	50–120	700	d.c.	52" Structural Mill	Direct	1925	Carnegie Steel Co.	Homestead, Pa.	W
1233	7000	50–120	700	d.c.	52" Structural Mill	Direct	1925	Carnegie Steel Co.	Homestead, Pa.	W
1234	7000	50–100	650	d.c.	46" Slabbing Mill	Direct	1925	Bethlehem Steel Co.	Sparrows Point, Md.	GE
1235	7000	55	900	d.c.	45" Blooming Mill	Direct	1917	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
1236	7000	50 100	700	d.c.	60" Universal Plate Mill	Direct	1919	Bethlehem Steel Co.	Sparrows Pt., Md.	W
1237	7000	81 7	6600	25 cy.	160" Plate Mill	Direct	1917	Illinois Steel Co.	Gary, Ind.	W
1238	7500–4040	250–134	2200	60	21" Continuous Sheet Bar and Skelp Mill	Geared	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
1239	8000	40–120	700	d.c.	54" Blooming Mill	Direct	1925	Carnegie Steel Co.	Homestead, Pa.	W
1240	8000	150	600	d.c.	28" Rail Mill	Direct	1917	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
1241	8000	240	13200	60 cy.	Interrupted Continuous Blooming Mill	Geared	1923	Ford Motor Co.	Detroit, Mich.	GE
1252	9000	107	6600	25	Continuous Billet Bar Mill	Direct	1925	McKinney Steel Co.	Cleveland, Ohio	GE

BLOOMING MILL DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd By
1	500	190	230	d.c.	24" Blooming Mill	Geared	1910	Sharon Steel Hoop Co.	Sharon, Pa.	GE
2	850	710	2200	60 cy.	20" Blooming Mill	Geared	1923	Washburn Wire Co.	Phillipsdale, R. I.	W
3	1200	585	2200	60 cy.	24" Blooming Mill	Geared	1919	McConway Torley Co.	Pittsburgh, Pa.	W
4	1500	355	2200	60 cy.	35" Blooming Mill	Geared	1924	Timken Roller Bearing Co.	Canton, Ohio	W
5	1500	375	2200	25 cy.	36" 3 High Blooming Mill	Geared	1920	Atlas Crucible Steel Co.	Dunkirk, N. Y.	GE
6	2000	75	2200	25 cy.	Blooming Mill	Direct	1916	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
7	2000	240	2200	60 cy.	32" Blooming Mill	Geared	1915	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	GE
8	2100	47–120	700	d.c.	34" Rev. Blooming Mill	Direct	1916	Penn Seaboard Steel Corporation	New Castle, Del.	W
9	2200	70–150	600	d.c.	28" Rev. Blooming Mill	Direct	1920	Atlantic Steel Co.	Atlanta, Ga.	W
10	2900	47–120	700	d.c.	34" Rev. Blooming Mill	Direct	1917	Sharon Steel Hoop Co.	Youngstown, Ohio	W
11	3250	40	500	d.c.	36" Blooming Mill	Direct	1916	American Rolling Mill Co.	Ashland, Ky.	GE
12	3250	40	500	d.c.	34" Blooming Mill	Direct	1916	Keystone Steel & Wire Co.	Peoria, Ill.	GE
13	3500	70–100	525	d.c.	32" Rev. Blooming Mill	Direct	1913	Steel Company of Canada	Hamilton, Ont.	W
14	3500	50– 75	700	d.c.	34" Rev. Blooming Mill	Direct	1914	Central Steel Co.	Massillon, Ohio	W
15	3500	50–120	700	d.c.	34" Blooming Mill	Direct	1925	Kokomo Steel & Wire Co.	Kokomo, Ind.	W
16	3500	50–120	700	d.c.	36" Blooming Mill	Direct	1925	Phoenix Iron Co.	Phoenixville, Pa.	W
17	3600	40– 90	600	d.c.	35" Rev. Blooming Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	W
18	3600	40– 90	600	d.c.	40" Rev. Blooming Mill	Direct	1918	Illinois Steel Co.	Gary, Ind.	W
19	4000	0– 80	1200	d.c.	34" Blooming Mill	Coupled		Algoma Steel Co.	Sault Ste. Marie,Can.	AC
20	5000	30–120	600	d.c.	40" Rev. Blooming Mill	Direct	1916	National Tube Co.	Lorain, Ohio	W
21	5000	50–120	600	d.c.	35" Rev. Blooming Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
22	5000	40–120	600	d.c.	35" Rev. Blooming Mill	Direct	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
23	6500	40–120	600	d.c.	40" Rev. Blooming Mill	Direct	1915	Inland Steel Co.	Indiana Harbor, Ind.	W
24	6500	50	600	d.c.	36" Blooming Mill	Direct	1916	Trumbull Steel Co.	Warren, Ohio	GE
25	6500	50	600	d.c.	40" Blooming Mill	Direct	1916	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
26	6500	50	600	d.c.	40" Blooming Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
27	7000	40–120	700	d.c.	Blooming Mill	Coupled	1925	Illinois Steel Co.	South Chicago, Ill.	AC
28	7000	50–120	700	d.c.	40" Rev. Blooming Mill	Direct	1923	Bethlehem Steel Co.	Lackawanna, N. Y.	W
29	7000	50–120	700	d.c.	44" Blooming Mill	Direct	1924	Carnegie Steel Co.	Homestead, Pa.	W
30	7000	50–120	700	d.c.	40" Blooming Mill	Direct	1924	International Harvester Co., Wisconsin Steel	Chicago, Ill.	W
31	7000	50–120	700	d.c.	36" Rev. Rougher Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	W
32	7000	50–100	650	d.c.	46" Slabbing Mill	Direct	1925	Bethlehem Steel Co.	Sparrows Point, Md.	GE
33	7000	55	900	d.c.	45" Blooming Mill	Direct	1917	Tenn. Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
34	8000	40–120	700	d.c.	54" Blooming Mill	Direct	1925	Carnegie Steel Co.	Homestead, Pa.	W
35	8000	240	13200	60 cy.	Interrupted Continuous Blooming Mill	Geared	1923	Ford Motor Co.	Detroit, Mich.	GE

PLATE MILL DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300	575	2200	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
2	300	575	2200	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
3	300	575	2200	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
4	300	575	2200	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
5	300	575	2200	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
6	300	575	2200	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
7	300	575	2200	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
8	400	20	230	d.c.	32 x 48 Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Ind.	CW
9	400	20	230	d.c.	32 x 48 Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Ind.	CW
10	400	20	230	d.c.	32 x 48 Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Ind.	CW
11	400	20	230	d.c.	32 x 48 Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Ind.	CW
12	500	200	500	d.c.	78" Rev. Brass Plate Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
13	500	575	2200	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
14	500	575	2200	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
15	600	885	2200	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
16	600	885	2200	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
17	800	0–37–70	500	d.c.	Plate Mill	Coupled		Universal Rolling Mill Co.	Bridgeville, Pa.	AC
18	1000	50–175	600	d.c.	24" Rev. Universal Plate	Direct	1916	Central Steel Co.	Massillon, Ohio	W
19	1100–1500	91	2200	25 cy.	84" Plate (Finishing) Mill	Direct	1909	American Sheet & Tin Plate Co.	Gary, Ind.	W
20	1200	214	2200	25 cy.	84" Plate mill	Geared	1913	Otis Steel Co.	Cleveland, Ohio	GE
21	1600	214	2200	25 cy.	84" Plate Mill	Geared	1913	Otis Steel Co.	Cleveland, Ohio	GE
22	1600	244	2200	25 cy.	84" Plate (Rough.) Mill	Geared	1912	Alan Wood Iron & Steel Co.	Ivy Rock, Pa.	W
23	1600	244	2200	25 cy.	84" Plate (Finishing) Mill	Geared	1912	Alan Wood Iron & Steel Co.	Ivy Rock, Pa.	W
24	1800	40	600	d.c.	84" Reversing Plate Mill	Direct	1917	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
25	2000	83	6600	25 cy.	96" Plate Mill	Coupled		Youngstown Sheet & Tube Co.	Youngstown, O.	AC
26	2000	83	6600	25 cy.	84" Plate Mill	Coupled		Youngstown Sheet & Tube Co.,	Youngstown, O.	AC
27	2000	214	2200	25	Jobbing plate mill	Geared	1925	Otis Steel Co.	Cleveland, Ohio	W
28	2000	244	2200	25 cy.	90" Plate Mill	Rope	1912	Inland Steel Co.	Indiana Harbor, Ind.	W
29	2000	375	2200	25 cy.	84" Plate Mill	Geared	1916	Donner Steel Co.	Buffalo, N. Y.	GE
30	2000	505	6600	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
31	2000	505	6600	60 cy.	Plate Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
32	2100	50–125	700	d.c.	42" Rev. Univ. Plate Mill	Direct	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
33	2200	50–120	600	d.c.	40" Rev. Univ. Plate Mill	Direct	1919	Dominion Foundrys & Steel Co.	Hamilton, Ont.	W
34	2500	235	2200	60 cy.	84" Plate (Finishing) Mill	Geared	1917	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
35	3000	245	2200	25 cy.	90" Plate Mill	Geared	1920	Inland Steel Co.	Indiana Harbor, Ind.	W
36	3000	235	2200	60 cy.	100" Plate Mill	Geared	1922	Nat'l Enameling & Stamping Co.	St. Louis, Mo.	W
37	3100	70–150	600	d.c.	Universal Plate Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
38	3750	500	2200	60	112" 3 High Plate Mill	Geared	1925	Lukens Steel Company	Coatesville, Pa.	W
39	4000	0–150	575	d.c.	36" Rev. Univ. Plate Mill	Direct	1905	Illinois Steel Co.	South Chicago, Ill.	W
40	4000	82	6600	60 cy.	110" Plate Mill	Direct	1917	Tenn. Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
41	4000	83	6600	25 cy.	110" Plate Mill	Direct	1916	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
42	4000	83	6600	25 cy.	110" Plate Mill	Direct	1917	Carnegie Steel Co.	Homestead, Pa.	GE
43	4000	82	6600	60 cy.	110" Plate Mill	Direct	1918	Dominion Iron & Steel Corp.	Sydney, N. S.	GE
44	4000	200	6600	60 cy.	120" Plate Mill	Geared	1920	Worth Steel Co.	Claymont, Del.	GE
45	5000	75–100	700	d.c.	48" Rev. Univ. Plate Mill	Direct	1923	Bethlehem Steel Co.	Lackawanna, N. Y.	W
46	5000	197	2200	60 cy.	132" Plate Mill	Geared	1917	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
47	5000	370	6600	25 cy.	132" Plate Mill	Geared	1922	Illinois Steel Co.	South Chicago, Ill.	W
48	5000	370	6600	25 cy.	90" Plate Mill	Geared	1922	Illinois Steel Co.	South Chicago, Ill.	W
49	6500–4500	107–53	6600	25 cy.	60" 3 High Univ. Plate	Direct	1909	Illinois Steel Co.	Gary, Ind.	GE
50	7000	0–100	700	d.c.	60" Rev. Univ. Plate Mill	Direct	1919	Bethlehem Steel Co.	Sparrows Point, Md.	W
51	7000	81.7	6600	25 cy.	160" Plate Mill	Direct	1916	Illinois Steel Co.	Gary, Ind.	W

RAIL AND STRUCTURAL MILL DRIVES

No	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	400	125	230	d.c.	12″ Structural Mill	Direct	1919	Eastern Steel Co.	Pottsville, Pa.	W
2	500	250–600	250	d.c.	12–9″ Mill	Coupled	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
3	750	500	230	d.c.	14″ Rail Rerolling Mill	Geared	1925	Ford Motor Co.	River Rouge, Mich.	AC
4	900	425–640	250	d.c.	12″ 10–Mill	Coupled	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
5	1000	133	2200	25 cy.	Structural (Finish) Mill	Direct	1910	Illinois Steel Co.	South Chicago, Ill.	W
6	1000	200–480	250	d.c.	12–9″ Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
7	1000	200–480	250	d.c.	12–9″ Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
8	1000–2000	200–400–600	250	d.c.	12–10″ Gautier Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
9	1000	590–495	6600	60 cy.	24″ Structural Mill	Geared	1917	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	W
10	1000	720	4000	60 cy.	18″ 2-Stand Rerolling Rail Mill	Geared	1923	Buckeye Rolling Mill Co.	Newark, Ohio	GE
11	1200	450	6600	60	Rail Mill, Finishing Stand	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
12	1200	500	2200	25 cy.	28″ Rail Mill	Geared	1914	Bethlehem Steel Co.	Steelton, Pa.	GE
13	1500	100–125	220	d.c.	Light Rail Mill	Direct	1905	Carnegie Steel Co.	Bessemer, Pa.	W
14	1500	100–125	220	d.c.	Light Rail Mill	Direct	1905	Carnegie Steel Co.	Bessemer, Pa.	W
15	1500	133–81.5	6600	25 cy.	18″ Structural Mill	Direct	1915	Bethlehem Steel Co.	Bethlehem, Pa.	W
16	1500	150–300	230	d.c.	18-14″ Structural Mill	Direct	1924	Bethlehem Steel Corporation	Johnstown, Pa.	AC
17	1500	150–300	230	d.c.	18-13″ Structural Mill	Direct	1924	Bethlehem Steel Corporation	Johnstown, Pa.	AC
18	1500–1250–1000	360–300–240	2200	25 cy.	28″ Rail Mill	Geared	1920	Bethlehem Steel Co.	Steelton, Pa.	GE
19	1500	600	2200	60 cy.	Light Rail Mill	Geared		West Va. Rail Co.	Huntington, W. Va.	AC
20	1700	250–500	250	d.c.	12–10″ Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
21	1750	150–300	230	d.c.	18-14″ Structural Mill	Direct	1924	Bethlehem Steel Corp.	Lackawanna, N. Y.	AC
22	1800	120–80	2200	25 cy.	Light Rail Mill	Direct	1905	Illinois Steel Co.	South Chicago, Ill.	W
23	1800	120–80	2200	25 cy.	Light Rail Mill	Direct	1905	Illinois Steel Co.	South Chicago, Ill.	W
24	1800	366	2200	25 cy.	22″ Structural Mill	Geared	1919	Scullin Steel Co.	St. Louis, Mo.	W
25	1800	366	2200	25 cy.	22″ Structural & Bar Mill	Geared	1919	Scullin Steel Co.	St. Louis, Mo.	W
26	2000 2000 2000	100–83.3–65	6600	25 cy.	12″ Structural Mill	Direct	1916	Bethlehem Steel Co.	Bethlehem, Pa.	GE
27	2000	68	6600	25 cy.	28″ Rail Mill	Direct	1906	Illinois Steel Co.	Gary, Ind.	GE
28	2000	214	6600	25 cy.	40″ Rail Mill	Geared	1906	Illinois Steel Co.	Gary, Ind.	GE
29	2000	214	6600	25 cy.	40″ Rail Mill	Geared	1906	Illinois Steel Co.	Gary, Ind.	GE
30	2000	450	6600	60	Rail Mill	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
31	2000	600	6600	60 cy.	Fin. Stand of 24″ Structural Mill	Geared	1924	Tenn. Coal, Iron & R.R. Co.	Fairfield, Ala.	GE
32	2500	82	6600	60 cy.	28″ Structural Mill	Direct	1917	Tenn. Coal, Iron & R.R. Co.	Fairfield, Ala.	GE
33	3000	91	2200	25 cy.	Structural (Rough.) Mill	Geared	1910	Illinois Steel Co.	South Chicago, Ill.	W
34	3000	150–300	230	d.c.	18-14″ Structural Mill	Direct	1924	Bethlehem Steel Corp.	Johnstown, Pa.	AC
35	3000	150–300	230	d.c.	18-13″ Structural Mill	Direct	1924	Bethlehem Steel Corp.	Johnstown, Pa.	AC
36	3000 3000 3000	155–144–130	6600	60 cy.	24″ Structural Mill	Direct	1917	Tenn. Coal, Iron & R.R. Co.	Fairfield, Ala.	GE
37	3000	325–485	600	d.c.	24″ Structural Mill	Geared	1923	Phoenix Iron Co.	Phoenixville, Pa.	W
38	3000	360	6600	60 cy.	28″ Rail Mill	Geared	1919	Dominion Iron & Steel Co.	Sydney, N. S.	GE
39	3000	450	6600	60	Rail Mill	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
40	3000	500	6600	25 cy.	26″ Rail Mill	Geared	1924	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
41	3000	500	6600	25 cy.	26″ Rail Mill	Geared	1924	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
42	3200	50–120	700	d.c.	34″ Rev. Struct. (Rough.)	Direct	1915	Inland Steel Co.	Indiana Harbor, Ind.	W
43	3200	50–120	700	d.c.	28″ Structural (Fin.) Mill	Direct	1915	Inland Steel Co.	Indiana Harbor, Ind.	W
44	3500	50–120	700	d.c.	35″ Struct. Mill (Rough.)	Direct	1924	Bethlehem Steel Corp.	Lackawanna, N. Y.	W
45	3500	50–100	650	d.c.	Rail Mill	Direct	1925	Bethlehem Steel Co.	Steelton, Pa.	GE
46	3500	150–300	230	d.c.	18-14″ Structural Mill	Direct	1924	Bethlehem Steel Corp.	Lackawanna, N. Y.	AC
47	4000	83	6600	60 cy.	33″ Structural Mill	Direct	1920	Carnegie Steel Co.	Homestead, Pa.	GE
48	4000	375	6600	25	Rail Mill	Geared	1925	Bethlehem Steel Co.	Steelton, Pa.	GE
49	5000	50–120	700	d.c.	36″ Struct. (Rough.) Mill	Direct	1924	Carnegie Steel Co.	Homestead, Pa.	W
50	5000	75–150	700	d.c.	28″ Structural (Fin.) Mill	Direct	1924	Bethlehem Steel Corp.	Lackawanna, N. Y.	W
51	5000	595	6600	60 cy.	28″ 3 Stand Rail Mill	Coupled		Tenn. Coal, Iron & R.R. Co.	Birmingham, Ala.	AC
52	6000	75	6600	25 cy.	40″ Rail Mill	Direct	1906	Illinois Steel Co.	Gary, Ind.	GE
53	6000	83	6600	25 cy.	28″ Rail Mill	Direct	1906	Illinois Steel Co.	Gary, Ind.	GE
54	6000	83	6600	25 cy.	28″ Rail Mill	Geared	1913	Minnesota Steel Co.	Duluth, Minn.	W
55	6000	88	6600	25 cy.	28″ Rail Mill	Direct	1906	Illinois Steel Co.	Gary, Ind.	GE
56	6000	98	6600	25 cy.	28″-32″ Structural Mill	Direct	1924	Carnegie Steel Co.	Homestead, Pa.	W
57	7000	50–150	700	d.c.	52″ Structural Mill	Direct	1925	Carnegie Steel Co.	Homestead, Pa.	W
58	7000	50–150	700	d.c.	52″ Structural Mill	Direct	1925	Carnegie Steel Co.	Homestead, Pa.	W
59	8000	150	600	d.c.	28″ Rail Mill	Direct	1917	Bethlehem Steel Co.	Lackawanna, N. Y.	GE

BAR AND BILLET MILL DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300	250	440	25 cy.	Cogging Mill	Geared	1910	Simonds Mfg. Co.	Lockport, N. Y.	GE
2	300	375	2200	25 cy.	Bar Mill	Coupled		Bethlehem Steel Co.	Johnstown, Pa.	AC
3	300	375	2200	25 cy.	10″ Bar Mill	Geared	1919	Hammond Steel Co.	Solvay, N. Y.	GE
4	300	400	550	40 cy.	10″ Bar Mill	Geared	1909	Ludlum Steel Co.	Watervliet, N. Y.	GE
5	300	450	230	d.c.	Bar Mill	Geared	1916	Carbon Steel Co.	Pittsburgh, Pa.	W
6	300	450	550	60 cy.	Bar Mill	Coupled		Nat'l Conduit & Cable Co.	Hast. on Hudson, N.Y	AC
7	300	514	2200	60 cy.	Bar Mill	Geared		C. G. Hussey	Pittsburgh, Pa.	AC
8	300–300–150	600–400–300	440	60 cy.	Bar Mill	Chain	1916	Vulcan Crucible Steel Co.	Aliquippa, Pa.	GE
9	300	600	2300	60 cy.	12″ Billet Mill	Geared	1916	Tenn. Coal, Iron & R. R. Co.	Bessemer, Ala.	GE
10	300	720	440	60 cy.	Bar Mill	Geared		Hoskins Mfg. Co.,	Detroit, Mich.	AC
11	300	750	2200	25 cy.	10″ Bar Mill	Geared	1923	Bethlehem Steel Co.	Lebanon, Pa.	GE
12	335	360	2200	60 cy.	Bar Mill	Geared	1915	Heppenstall Forge & Knife Co.	Pittsburgh, Pa.	GE
13	350	125	6600	25 cy.	12″ Bar Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
14	350–350	360–240	440	60 cy.	Bar Mill	Coupled		Simmons Mfg. Co.	Kenosha, Wis.	AC
15	350	600	2200	60 cy.	Bar Mill	Belted		Joslyn Mfg. Co.	Chicago, Ill.	AC
16	400–400	107–64	2200	25 cy.	16″ Bar Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
17	400	400	400	60 cy.	Bar Mill	Chain		Latrobe Steel Co.	Latrobe, Pa.	AC
18	400	450	2200	60 cy.	12″ Bar Mill	Geared	1924	Atchison, Topeka & Santa Fe Ry.		AC
19	400	450	2200	60 cy.	9″ Bar Mill	Geared	1924	Atchison, Topeka & Santa Fe Ry.		AC
20	400	514	2200	60 cy.	Bar Mill	Geared		Judson Mfg. Co.	Oakland, Calif.	AC
21	400–225	600–300	550	40 cy.	Bar Mill	Geared	1909	Ludlum Steel Co.	Watervliet, N. Y.	GE
22	400	705	2200	60 cy.	16″ Cogging Mill	Geared	1923	Crucible Steel Co. of America	Park Works, Pgh., Pa	W
23	400	720–450	2200	60 cy.	Bar Mill	Geared		Cyclops Steel Co.	Titusville, Pa.	AC
24	400–265	875–585	2200	60 cy.	Bar Mill	Geared	1913	Old Dominion Iron & Nail Co.	Richmond, Va.	W
25	400	900	2200	60	Bar and Billet Mill	Geared	1925	Crucible Steel Co.	Pittsburgh, Pa.	W
26	450	125	6600	25 cy.	12″ Bar Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
27	500	250	440	25 cy.	10″ Bar Mill	Geared	1917	Simonds Mfg. Co.	Lockport, N. Y.	GE
28	500	300	2200	60 cy.	Bar Mill	Coupled		Ft. Wayne Rolling Mill Co.	Ft. Wayne, Ind.	AC
29	500	360	2200	60 cy.	16″ Bar Mill	Geared	1915	Tenn. Coal, Iron & R. R. Co.	Bessemer, Ala.	GE
30	500	450	440	60 cy.	Bar Mill	Geared	1910	Chase Rolling Mills Co.	Waterbury, Conn.	GE
31	500	450	440	60 cy.	Bar Mill	Geared	1910	Chase Rolling Mills Co.	Waterbury, Conn.	GE
32	500	450	440	60 cy.	16″ Bar Mill	Geared	1914	Carbon Steel Co.	Pittsburgh, Pa.	GE
33	500	450	2200	60 cy.	Billet Mill	Geared	1915	International High Speed Steel Co	Rockaway, N. J.	GE
34	500	450	2200	60	Bar Mill	Geared	1925	Indianapolis Steel Products Co.	Indianapolis, Ind.	AC
35	500	500	2200	25 cy.	16″ Bar Mill	Geared	1919	Hammond Steel Co.	Solvay, N. Y.	GE
36	500	514	2200	60 cy.	Bar Mill.	Rope		Henry Disston & Son	Philadelphia, Pa.	AC

BAR AND BILLET MILL DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
37	500	514	2200	60 cy.	Bar Mill	Geared		Metals Production Equip. Co	Springfield, Mass.	AC
38	500	514	2200	60 cy.	Bar Mill	Geared		Metals Production Equip. Co.	Springfield, Mass.	AC
39	500	514	2200	60 cy.	Bar Mill	Geared		Metals Production Equip. Co.	Springfield, Mass.	AC
40	500	514	440	60 cy.	Bar Mill	Chain		Simmons Mfg. Co.	Kenosha, Wis.	AC
41	500	514	2200	60 cy.	Bar Mill	Geared		Judson Mfg. Co.	Oakland, Calif.	AC
42	500	600	2200	60 cy.	Bar Mill	Belted		Joslyn Mfg. Co.	Chicago, Ill.	AC
43	600	171	440	40 cy.	Bar Mill	Geared	1910	Ludlum Steel Co.	Watervliet, N. Y.	GE
44	600	300	2200	25 cy.	Muck Mill	Chain Coupled		St. Louis Screw Co.	St. Louis, Mo.	AC
45	600-600	300-214	2200	25 cy.	Bar Mill	& Rope		St. Louis Screw Co.	St. Louis, Mo.	AC
46	600	300-214	2200	25 cy.	Bar Mill	Chain		St. Louis Screw Co.	St. Louis, Mo.	AC
47	600	300-330		d.c.	10″ Bar Mill	Coupled	1921	Universal Steel Company	Bridgeville, Pa.	CW
48	600	368	6600	25 cy.	18-21″ Bar (Rough.) Mill	Geared	1924	Pittsburgh Crucible Steel Co.	Midland, Pa.	GE
49	600	490	2200	25 cy.	16″ Bar (Roughing) Mill	Geared	1919	Scullin Steel Co.	St. Louis, Mo.	W
50	700	250	2200	25 cy.	18″ Bar Mill	Rope	1911	Dilworth Porter Co.	Pittsburgh, Pa.	GE
51	700	390	2200	60 cy.	18″ Bar Mill	Geared	1922	Dilworth Porter Co.	Pittsburgh, Pa.	W
52	700	600		60	14″ Bar Mill	Coupled	1921	Universal Steel Company	Bridgeville, Pa.	CW
53	750	120-210	250	d.c.	14″ Bar Mill	Coupled	1923	Pittsburgh Crucible Steel Co.	Midland, Pa.	AC
54	750	120-210	250	d.c.	14″ Bar Mill	Coupled	1923	Pittsburgh Crucible Steel Co.	Midland, Pa.	AC
55	750-750	225-168	440	60 cy.	Bar Mill	Coupled		Simmons Mfg. Co.	Kenosha, Wis.	AC
56	750	250	2200	25 cy.	Bar Mill	Geared		Bethlehem Steel Co.	Johnstown, Pa.	AC
57	750	250	440	25 cy.	Bar Mill	Coupled		Simonds Mfg. Co.	Lockport, N. Y.	AC
58	800	220-150	2200	25 cy.	12″ Bar (Finishing) Mill	Direct	1919	Scullin Steel Co.	St. Louis, Mo.	W
59	800	250	2200	60 cy.	22″ Bar Mill	Rope	1915	Timken Roller Bearing Co.	Canton, Ohio	W
60	800	257	2200	60 cy.	Bar Mill	Geared	1914	Standard Seamless Tube Co.	Economy, Pa.	GE
61	800	277	2200	60 cy.	Bar Mill	Geared		Pacific Coast Steel Co.	San Francisco, Calif.	AC
62	800	292	2200	25 cy.	18″ Tandem Billet Mill	Direct	1912	Laclede Steel Co.	Alton, Ill.	W
63	800	350	2200	60 cy.	Billet Mill	Geared	1915	Milton Manufacturing Co.	Milton, Pa.	W
64	800	514	2200	60 cy.	Bar Mill	Geared		Judson Mfg. Co.	Oakland, Calif.	AC
65	800-400	600-300	550	40 cy.	Bar Mill	Geared	1916	Ludlum Steel Co.	Watervliet, N. Y.	GE
66	800-400	600-300	550	40 cy.	Bar Mill	Geared	1917	Ludlum Steel Co.	Watervliet, N. Y.	GE
67	800	730-365	2200	50 cy.	22″ Bar Mill	Geared	1916	Columbia Steel Co.	Los Angeles, Cal.	W
68	800	880-490	2200	60 cy.	16″ Bar Mill	Geared	1920	Knoxville Iron Co.	Knoxville, Tenn.	W
69	850	505	2200	60 cy.	24″ Bar (Roughing) Mill	Geared	1919	Central Steel Co.	Massillon, Ohio	W
70	1000	277	2200	60 cy.	22″ Bar Mill	Geared	1919	Pennsylvania Forge Co.	Philadelphia, Pa.	GE
71	1000	375	2200	25 cy.	Bar Mill	Geared		Bethlehem Steel Co.	Johnstown, Pa.	AC
72	1000	450	2200	60 cy.	Bar Mill	Rope		Pacific Coast Steel Co.	Seattle, Wash.	AC
73	1000	710	2200	60	20″ Special Bar	Geared	1925	Rail Joint Company	Troy, N. Y.	W
74	1000	710	2200	60	20″ Special Bar	Geared	1925	Rail Joint Company	Troy, N. Y.	W
75	1200-1000-800	150-275-300	6600	25 cy.	18″ Bar Mill, No. 16	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
76	1200	505	2200	60 cy.	Bar (Roughing) Mill	Geared	1922	Youngstown Steel Co.	Youngstown, Ohio	W
77	1200	514	2200	60 cy.	Bar Mill	Geared		Elyria Iron & Steel Co.	Elyria, Ohio	AC
78	1250	375	2080	25 cy.	18″ Billet Mill	Geared	1918	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
79	1250	375	2080	25 cy.	18″ Billet Mill	Geared	1918	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
80	1400	505	2200	60 cy.	14″ Billet Mill	Geared	1917	Wickwire Spencer Steel Corp.	Palmer, Mass.	W
81	1500	182-162	6600	25 cy.	10″ Bar Mill	Direct	1913	Carnegie Steel Co.	Duquesne, Pa.	W
82	1500	266	6400	25 cy.	Billet Mill	Geared	1916	American Steel & Wire Co.	Cleveland, Ohio	W
83	1500	270	2200	60 cy.	22″ Bar and Billet Mill	Geared	1918	Central Steel Co.	Massillon, Ohio	W
84	1500	440	2200	60 cy.	22″ Bar Mill	Geared	1919	Kansas Bolt & Nut Co.	Kansas City, Mo.	W
85	1500	450	2200	60 cy.	Bar Mill	Rope		Pacific Coast Steel Co.	Seattle, Wash.	AC
86	1500	450	2200	60 cy.	Roughing Mill	Geared		Pacific Coast Steel Co.	San Francisco, Calif.	AC
87	1500	705	2200	60 cy.	24″ Bar (Finishing) Mill	Geared	1922	Youngstown Steel Co.	Youngstown, Ohio	W
88	1500	705	2200	60 cy.	22″ Bar Mill	Geared	1924	Atchison, Topeka & Santa Fe Ry.		AC
89	1500	735	2200	25 cy.	Bar Mill	Geared	1923	Scullin Steel Co.	St. Louis, Mo.	AC
90	1600	150	6600	25 cy.	Bar Mill	Direct	1912	Pittsburgh Crucible Steel Co.	Pittsburgh, Pa.	GE
91	1600	257	2200	60 cy.	14″ Cont. Billet Mill	Geared	1912	Atlantic Steel Co.	Atlanta, Ga.	GE
92	1600	280	2200	60 cy.	Continuous Billet Mill	Geared	1913	Steel Company of Canada	Hamilton, Ont.	W
93	1650-1500-1350	413-375-337	6600	25 cy.	10″ Bar Mill, No. 10	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
94	1750	70-120	600	d.c.	29″ Reversing Billet Mill	Direct	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
95	1800	75	6600	25 cy.	30″ Billet Mill	Direct	1914	Bethlehem Steel Co.	Bethlehem, Pa.	GE
96	1800	75	6600	25 cy.	30″ Billet Mill	Direct	1914	Bethlehem Steel Co.	Bethlehem, Pa.	GE
97	1800	366	2200	25 cy.	22″ Billet and Struct. Mill	Geared	1919	Scullin Steel Co.	St. Louis, Mo.	W
98	1800-1800-1800	370-300-247	6600	60 cy.	Sheet Bar Mill	Geared	1920	American Rolling Mill Co.	Ashland, Ky.	GE
99	1850-1450- 925	120- 94- 60	6600	25 cy.	16″ Hand Bar Mill	Direct	1921	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
100	2000	50-100	600	d.c.	30″ Reversing Bar Mill	Direct	1919	Follansbee Brothers Co.	Toronto, Ohio	W
101	2000	214	6600	25 cy.	40″ Billet Mill	Geared	1907	Illinois Steel Co.	Gary, Ind.	GE
102	2000	214	6600	25 cy.	40″ Billet Mill	Geared	1907	Illinois Steel Co.	Gary, Ind.	GE
103	2000	240	2200	60 cy.	18″ Sheet Bar Mill	Geared	1920	Nat. Enameling & Stamping Co.	Granite City, Ill.	GE
104	2200-2000-1800	275-250-225	6600	25 cy.	10″ Bar Mill, No. 15	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
105	2200	505-303	2200	60 cy.	18″ Bar (Finishing) Mill	Geared	1919	Central Steel Co.	Massillon, Ohio	W
106	2500	150	6600	25 cy.	28″ Billet Mill	Geared	1923	Pittsburgh Crucible Steel Co.	Midland, Pa.	GE
107	2500	240	2200	60 cy.	24″ Sheet Bar Mill	Geared	1920	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	GE
108	2500	500	2200	60 cy.	22″ Bar Mill	Geared	1923	Phoenix Iron Co.	Phoenixville, Pa.	W
109	2750-2500-2250	275-250-225	6600	25 cy.	14″ Bar Mill, No. 14	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
110	3000	70-150	750	d.c.	24″ Bar Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
111	3000	250	6600	25 cy.	18″ Cont. Billet Mill	Geared	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
112	3000	375	2200	25 cy.	18″ Billet Mill	Geared	1916	Donner Steel Co.	Buffalo, N. Y.	GE
113	3000	375	6600	25 cy.	24″ Sheet Bar Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	GE
114	3250	94	6600	25 cy.	18″ Sheet Bar Mill	Direct	1916	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
115	3500	92	2200	50 cy.	18″ Sheet Bar Mill	Direct	1916	Trumbull Steel Co.	Warren, Ohio	GE
116	3500	92	2200	60 cy.	21″ Sheet Bar Mill	Direct	1918	Trumbull Steel Co.	Warren, Ohio	GE
117	4000	83	6600	25 cy.	24″ Cont. Billet Mill	Direct	1916	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
118	4000	93	6600	60 cy.	18″ Continuous Bar Mill	Direct	1919	Weirton Steel Co.	Weirton, W. Va.	W
119	4000	93	6600	60 cy.	21″ Continuous Bar Mill	Direct	1919	Weirton Steel Co.	Weirton, W. Va.	W
120	4000	360	2200	60 cy.	21″ Sheet Bar Mill	Geared	1917	Sharon Steel Hoop Co.	Lowellville, Ohio	GE
121	4200	93	2200	60 cy.	Continuous Bar Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
122	5000	99	13200	50	18″ Billet Mill	Direct	1925	Ford Motor Company	Detroit, Mich.	W
123	5000	450	2300	60 cy	18″ Cont. Sheet Bar & Billet Mill	Geared	1919	Wheeling Steel Corp.	Portsmouth, Ohio	GE
124	5000	594	6600	60 cy.	Sheet and Billet Mill	Geared	1924	Tenn. Coal, Iron & R. R. Co.	Birmingham, Ala.	GE
125	5750	94	6600	25 cy.	21″ Cont. Billet Mill	Direct	1914	McKinney Steel Co.	Cleveland, Ohio	GE
126	5750	94	6600	25 cy.	18″ Bar Mill	Direct	1915	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
127	5750	94	6600	25 cy.	21″ Bar Mill	Direct	1921	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
128	5750	94	6600	25 cy.	18″ Billet Mill	Geared	1923	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
129	5750	94	6600	25 cy.	21″ Billet Mill	Geared	1923	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
130	6000	83	6600	25 cy.	32″ Billet Mill	Direct	1907	Illinois Steel Co.	Gary, Ind.	GE
131	6000	83	6600	25 cy.	24″ Billet Mill	Direct	1907	Illinois Steel Co.	Gary, Ind.	GE
132	6000	83	6600	25 cy.	18″ Billet Mill	Direct	1907	Illinois Steel Co.	Gary, Ind.	GE
133	6000	83	6600	25 cy.	18″ Sheet Bar Mill	Direct	1910	Illinois Steel Co.	Gary, Ind.	GE
134	6250	368	2200	25 cy.	24″ Cont. Billet Mill	Geared	1922	Inland Steel Co.	Indiana Harbor, Ind.	W
135	9000	107	6600	25	Cont. Billet Bar Mill	Direct	1925	McKinney Steel Co.	Cleveland, Ohio	GE

SHEET BAR AND SKELP MILL DRIVES

No.	Horse Power	R.P.M.	Voltage	Current	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	350	500	230	d.c.	16″ Cont. Skelp Mill	Geared	1924	Gary Tube Co.	Gary, Ind.	AC
2	550	575	2200	60 cy.	16″ Skelp Mill	Geared	1919	Tyler Tube & Pipe Co.	Washington, Pa.	W
3	800	350	2200	60 cy.	24″ Sheet Bar (B.H.) Mill	Geared	1915	Central Steel Co.	Massillon, Ohio	W
4	1000	125	230	d.c.	Sheet Bar Mill	Geared	1920	Allegheny Steel Co.	Brackenridge, Pa.	GE
5	1000	209	6600	25 cy.	14″ Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
6	1000	293	6600	25 cy.	14″ Cont. Skelp Mi..	Geared	1924	Gary Tube Co.	Gary, Ind.	AC
7	1000	600	2200	60 cy.	16″ Skelp Mill	Geared	1923	Elyria Iron & Steel Co.	Elyria, Ohio	GE
8	1250	294	6600	25 cy.	14″ Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
9	1500	234	2200	60 cy.	26″ Sheet Bar Mill	Geared	1916	Canton Sheet Steel Co.	Canton, Ohio	W
10	1500	270	2200	60 cy.	24″ Sheet Bar Mill	Geared	1914	Central Steel Co.	Massillon, Ohio	W
11	1500	270	2200	60 cy.	22″ Sheet Bar, Billet Mill	Geared	1918	Central Steel Co.	Massillon, Ohio	W
12	1500	277	2200	d.c.	22″ Skelp Mill	Direct	1924	Bethlehem Steel Corp.	Coatesville, Pa	GE
13	1500	368	2200	25 cy.	Sheet Bar (Fin.) Mill	Geared	1923	Inland Steel Co.	Chicago, Ill.	W
14	1500	450	2200	30 cy.	3 High Skelp Mill	Geared	1915	Spang Chalfant Co.	Etna, Pa.	GE
15	1500	491	6600	25 cy.	14″ Cont. Skelp Mill	Geared	1924	Gary Tube Co.	Gary, Ind.	AC
16	2000	50–100	600	d.c.	30″ Rev. Sheet Bar Mill	Direct	1919	Follansbee Brothers Co.	Toronto, Ohio	W
17	2000	85–165	600	d.c.	21″ Continuous Sheet Bar and Skelp Mill	Direct	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
18	2000	85–165	600	d.c.	21″ Continuous Sheet Bar and Skelp Mill	Direct	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
19	2000	85–165	600	d.c.	21″ Continuous Sheet Bar and Skelp Mill	Direct	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
20	2000	234–161	2200	60 cy.	10″ Skelp (Fin.) Mill	Belted	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
21	2000–2000	250–161	6600	25 cy.	10″ Skelp Mill	Geared	1915	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
22	2000	294	6600	25 cy.	14″ Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
23	2000	350–234	2200	60 cy.	10″ Skelp (Rough.) Mill	Geared	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
24	2300–1300	115.4–65	6600	25 cy.	10″ Skelp Mill	Geared	1915	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
25	2500	146	6600	25 cy.	16″ Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
26	2500	184	6600	25 cy.	Skelp Mill	Rope	1908	National Tube Co.	Lorain, Ohio	W
27	2500	184	6600	25 cy.	Skelp Mill	Rope	1908	National Tube Co.	Lorain, Ohio	W
28	2500	252	2200	60 cy.	Skelp Mill	Geared		Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
29	2500	252	2200	60 cy.	Skelp Mill	Geared		Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
30	2500	295	6600	25 cy.	16″ Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
31	3000	184	6600	25 cy.	16″ Cont. Skelp Mill	Coupled	1924	Gary Tube Co.	Gary, Ind.	AC
32	3000	354–212	2200	60 cy.	Skelp Mill	Geared	1920	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
33	3600–1940	290–156	2200	60	21″ Continuous Sheet Bar and Skelp Mill	Geared	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
34	4000	80	650	d.c.	30″ Universal Skelp Mill	Direct	1922	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
35	4500	120–255	750	d.c.	Univ. Skelp Mill	Coupled	1925	Gary Tube Co.	Gary, Ind.	AC
36	5500	370	6600	25 cy.	16″ Cont. Skelp Mill	Geared	1924	Gary Tube Co.	Gary, Ind.	AC
37	7500–4040	250–134	2200	60	21″ Continuous Sheet Bar and Skelp Mill	Geared	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE

SHEET AND TIN PLATE DRIVES

No.	Horse Power	R.P.M.	Voltage	Current	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300	250	440	25 cy.	Sheet Mill	Geared	1910	Simonds Mfg. Co.	Lockport, N. Y.	GE
2	350	320	2200	60 cy.	Sheet Mill	Geared	1917	Universal Steel Co.	Bridgeville, Pa.	W
3	350	400–600		d.c.	Hot Mill	Geared	1913	Bethlehem Steel Corp.	Lackawanna, N. Y.	CW
4	350	400–600		d.c.	Hot Mill	Geared	1913	Bethlehem Steel Corp.	Lackawanna, N. Y.	CW
5	400	360	2300	60	Sheet Mill, Cold Rolls	Geared	1925	Thomas Sheet Steel Co.	Niles, Ohio	GE
6	500	300	2200	60 cy.	Sheet Mill			U. S. Aluminum Co.	New Kensington, Pa.	AC
7	500	300	2200	60 cy.	Sheet Mill			U. S. A uminum Co.	New Kensington, Pa.	AC
8	500	300	2200	60 cy.	Sheet Mill			U. S. Aluminum Co.	New Kensington, Pa.	AC
9	500	450	2200	60 cy.	Sheet Mill	Geared	1915	American Brass Co.	Torrington, Conn.	GE
10	600	300	2200	60 cy.	Sheet Mill	Geared		Universal Rolling Mill Co.	Bridgeville, Pa.	AC
11	700	320	2200	60 cy.	Sheet and Jobbing Mill	Direct	1917	Carbon Steel Co.	Pittsburgh, Pa.	W
12	750	94	2200	25 cy.	Sheet Mill	Rope	1912	West Penn Steel Co.	Brackenridge, Pa.	GE
13	750	250	2200	60 cy.	Tin Mill	Geared	1914	Weirton Steel Co.	Weirton, W. Va.	W
14	800	214	2200	25 cy.	Sheet Mill	Geared	1919	Am. Sheet & Tin Plate Co.	Gary, Ind.	GE
15	800	214	2200	25 cy.	Sheet Mill	Geared	1919	Am. Sheet & Tin Plate Co.	Gary, Ind.	GE
16	900	94	2200	25 cy.	Jobbing Sheet Mill	Rope	1910	Am. Sheet & Tin Plate Co.	Gary, Ind.	GE
17	900	94	2200	25 cy.	Jobbing Sheet Mill	Rope	1910	Am. Sheet & Tin Plate Co.	Gary, Ind.	GE
18	1000	83	2200	25 cy.	Sheet Mill	Rope	1910	Follansbee Bros.	Follansbee, W. Va.	GE
19	1000	235	2200	60	Cold Rolled Tin Mill	Coupled	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	AC
20	1000	235	2200	60	Cold Rolled Tin Mill	Coupled	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	AC
21	1000	240	440	60 cy.	Sheet Mill			Hudson Sh. & T. P. Co.	Monetta, Ohio	AC
22	1000	245	2200	25 cy.	30″ Sheet Mill	Rope	1910	American Rolling Mill Co.	Middletown, Ohio	W
23	1000	250	6600	25 cy.	Sheet Mill	Geared	1919	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
24	1000	250	6600	25 cy.	Sheet Mill	Geared	1919	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
25	1000	250	6000	25 cy.	Tin Mill	Geared	1919	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
26	1000	250	6600	25 cy.	Tin Mill	Geared	1919	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
27	1000	250	2200	25 cy.	Sheet Mill			Otis Steel Co.,	Cleveland, Ohio	AC
28	1000	250	2200	25 cy.	Sheet Mill			Otis Steel Co.	Cleveland, Ohio	AC
29	1000	252	2200	60 cy.	Sheet Mill	Geared	1920	American Rolling Mill Co.	Zanesville, Ohio	W
30	1000	300	2200	60 cy.	Sheet Mill	Geared	1919	Superior Sheet Steel Co.	Canton, Ohio	GE
31	1000	300	2200	60 cy.	Sheet Mill	Geared	1919	Superior Sheet Steel Co.	Canton, Ohio	GE
32	1000	300	2200	60 cy.	Sheet Mill	Geared	1920	Milwaukee Rolling Mills Co.	Milwaukee, Wis.	GE
33	1000	300	2200	60 cy.	Sheet Mill	Geared	1920	Milwaukee Rolling Mills Co.	Milwaukee, Wis.	GE
34	1000	300	2200	60	Sheet Mill	Geared	1925	Sharon Steel Hoop Co.	Sharon, Pa.	CW
35	1000	300	2200	60	Sheet Mill	Geared	1925	Sharon Steel Hoop Co.	Sharon, Pa.	CW
36	1000	300	2200	60	Sheet Mill	Geared	1925	Sharon Steel Hoop Co.	Sharon, Pa.	CW
37	1000	600	2200	60	Sheet Mill	Geared	1925	American Nickel Corp.	Clearfield, Pa.	GE
38	1150	250	6600	25 cy.	Jobbing Sheet Mill	Geared	1913	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
39	1200	214	2200	25 cy.	Jobbing Sheet Mill	Geared	1913	Otis Steel Co.	Cleveland, Ohio	GE
40	1200	240	2200	60 cy.	Sheet Mill	Geared	1915	Empire Rolling Mills	Cleveland, Ohio	GE
41	1200	240	2200	60 cy.	Sheet Mill	Geared	1916	Mahoning Valley Steel Co.	Niles, Ohio	GE
42	1200	240	2200	60 cy.	Sheet Mill	Geared	1916	United Alloy Steel Corp.	Canton, Ohio	GE
43	1200	240	2200	60 cy.	Sheet Mill	Geared	1917	United Alloy Steel Corp.	Canton, Ohio	GE
44	1200	240	2200	60 cy.	Sheet Mill	Geared	1920	Republic Iron & Steel Co.	Youngstown, Ohio	GE
45	1200	240	2200	60 cy.	Sheet Mill	Geared	1920	Republic Iron & Steel Co.	Youngstown, Ohio	GE
46	1200	240	440	25 cy.	26″ Sheet Mill	Rope	1907	Seneca Iron & Steel Co.	Buffalo, N. Y.	W
47	1200	240		60	Hot Sheet Mill	Coupled	1915	Standard Tin Plate Company	Canonsburg, Pa.	CW
48	1200	240		60	Hot Sheet Mill	Coupled	1915	Standard Tin Plate Company	Canonsburg, Pa.	CW
49	1200	240		60	Hot Sheet Mill	Coupled	1915	Standard Tin Plate Company	Canonsburg, Pa.	CW
50	1200	240		60	Hot Sheet Mill	Coupled	1916	Standard Tin Plate Company	Canonsburg, Pa.	CW
51	1200	240		60	Hot Sheet Mill	Coupled	1916	Standard Tin Plate Company	Canonsburg, Pa.	CW
52	1200	244	2200	25 cy.	Sheet Mill	Geared	1916	Bethlehem Steel Co.	Sparrows Pt., Md.	W
53	1200	244	2200	25 cy.	Sheet Mill	Geared	1916	Bethlehem Steel Co.	Sparrows Pt., Md.	W

SHEET AND TIN PLATE DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
54	1200	244	2200	25 cy.	Sheet Mill	Geared	1920	American Rolling Mill Co.	Middletown, Ohio	W
55	1200	244	2200	25 cy.	Sheet Mill	Geared	1920	American Rolling Mill Co.	Middletown, Ohio	W
56	1200	277	2200	60	Sheet Mill	Geared	1925	Wheeling Steel Corp.	Wheeling, W. Va.	GE
57	1200	295	6600	60 cy.	Sheet Mill	Coupled		Weirton Steel Co.	Weirton, W. Va.	AC
58	1200	295	6600	60 cy.	Sheet Mill	Coupled		Weirton Steel Co.	Weirton, W. Va.	AC
59	1200	300	4100	60 cy.	Sheet Mill	Geared	1920	Chapman Price Steel Co.	Indianapolis, Ind.	GE
60	1200	300	2200	60 cy.	Sheet Mill	Geared	1920	Central Steel Co.	Massillon, Ohio	GE
61	1200	300	2200	60 cy.	Sheet Mill	Geared	1920	Central Steel Co.	Massillon, Ohio	GE
62	1200	300	2200	60 cy.	Sheet Mill	Geared	1924	Thomas Sheet-Steel Co.	Niles, Ohio	GE
63	1200	300	2200	60 cy.	Sheet Mill	Geared	1924	Thomas Sheet Steel Co.	Niles, Ohio	GE
64	1200	352	2200	60 cy.	Sheet Mill	Rope	1917	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	W
65	1250	250	6600	25 cy.	Hot Tin Mill	Geared	1924	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
66	1250	250	6600	25 cy.	Hot Tin Mill	Geared	1924	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
67	1250	250	6600	25 cy.	Cold Tin Mill	Geared	1924	Bethlehem Steel Co.	Sparrows Pt., Md.	GE
68	1400	240	2200	60 cy.	Sheet Mill	Geared	1912	Apollo Steel Co.	Apollo, Pa.	GE
69	1500	187	2200	25 cy.	Sheet Mill	Chain		National Enamel & Stamp. Co.	Granite City, Ill.	AC
70	1500	210	2200	25 cy.	30" Sheet Mill	Rope	1910	American Rolling Mill Co.	Middletown, Ohio	W
71	1500	234	2200	60 cy.	Sheet Mill	Geared	1915	Canton Sheet Steel Co.	Canton, Ohio	W
72	1500	234	2200	60 cy.	Sheet Mill	Geared	1916	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	W
73	1500	234	2200	60 cy.	Sheet Mill	Geared	1917	Liberty Steel Co.	Warren, Ohio	W
74	1500	234	2200	60 cy.	Sheet Mill	Geared	1919	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	W
75	1500	240	2200	60 cy.	Sheet Mill	Geared	1922	United Alloy Steel Corp.	Canton, Ohio	GE
76	1500	240	2200	60 cy.	Sheet Mill	Geared		Follensbee Bros.	Toronto, Ohio	AC
77	1500	240	2200	60 cy.	Sheet Mill	Geared		Follensbee Bros.	Toronto, Ohio	AC
78	1500	240	2200	60 cy.	Sheet Mill			Canton Sheet Steel Co.	Canton, Ohio	AC
79	1500	250	2200	25 cy.	Sheet Mill	Geared	1919	Eastern Rolling Mills Co.	Baltimore, Md.	GE
80	1500	250	2200	25 cy.	Sheet Mill	Geared	1919	Eastern Rolling Mills Co.	Baltimore, Md.	GE
81	1500	270	2200	60 cy.	Sheet Mill	Geared	1914	Youngstown Sheet & Tube Co.	Warren, Ohio	W
82	1500	295	2200	60 cy.	Sheet Mill	Geared	1924	Kansas City Bolt & Nut Co.	Kansas City, Mo.	AC
83	1500	300	4600	25 cy.	Sheet Mill	Geared	1922	Michigan Steel Corp.	Detroit, Mich.	GE
84	1500	300	4600	25 cy.	Sheet Mill	Geared	1924	Michigan Steel Corp.	Detroit, Mich.	GE
85	1500	360	4000	60 cy.	Sheet Mill	Geared	1923	Metal & Thermit Corp.	So.San Francisco,Cal	GE
86	1500	360	2200	60 cy.	Sheet Mill	Geared	1923	Columbia Steel Co.	Pittsburgh, Cal.	GE
87	1600	94	2200	25 cy.	Sheet Mill	Rope	1910	American Sheet & Tin Plate Co.	Gary, Ind.	GE
88	1600	94	2200	25 cy.	Sheet Mill	Rope	1910	American Sheet & Tin Plate Co.	Gary, Ind.	GE
89	1600	94	2200	25 cy.	Sheet Mill	Rope	1913	American Sheet & Tin Plate Co.	Gary, Ind.	GE
90	1600	94	2200	25 cy.	Sheet Mill	Rope	1913	American Sheet & Tin Plate Co.	Gary, Ind.	GE
91	1600	94	2200	25 cy.	Tin Mill	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
92	1600	94	2200	25 cy.	Tin Mill	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
93	1600	94	2200	25 cy.	Tin Mill	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
94	1600	94	2200	25 cy.	Tin Mill	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
95	1600	210	2200	25 cy.	Sheet Mill	Geared	1912	Inland Steel Co.	Indiana Harbor, Ind.	W
96	1600	240	2200	60 cy.	Sheet Mill	Geared	1919	Falcon Steel Co.	Niles, Ohio	GE
97	1600	250	440	25 cy.	Sheet Mill	Geared	1914	Seneca Iron & Steel Co.	Buffalo, N. Y.	GE
98	1600	270	2200	60 cy.	Sheet Mill	Geared	1916	Wheeling Steel Corporation	Wheeling, W Va.	W
99	1600	270	2200	60 cy.	Sheet Mill	Geared	1916	Wheeling Steel Corporation	Portsmouth, Ohio	W
100	1700	214	2200	25 cy.	Sheet Mill	Geared	1915	American Sheet & Tin Plate Co.	Gary, Ind.	GE
101	1700	214	2200	25 cy.	Tin Mill	Geared	1915	American Sheet & Tin Plate Co.	Gary, Ind.	GE
102	1700	214	2200	25 cy.	Tin Mill	Geared	1915	American Sheet & Tin Plate Co.	Gary, Ind.	GE
103	1700	214	2200	25 cy.	Tin Mill	Geared	1918	American Sheet & Tin Plate Co.	Gary, Ind.	GE
104	1700	214	2200	25 cy.	Tin Mill	Geared	1918	American Sheet & Tin Plate Co.	Gary, Ind.	GE
105	1700	214	2200	25 cy.	Tin Mill	Geared	1918	American Sheet & Tin Plate Co.	Gary, Ind.	GE
106	1700	214	2200	25 cy.	Tin Mill	Geared	1919	American Sheet & Tin Plate Co.	Gary, Ind.	GE
107	1700	250	440	25	Hot Sheet Mill	Geared	1925	Seneca Iron & Steel Co.	Buffalo, N. Y.	GE
108	1800	235	2200	60 cy.	Sheet Mill	Geared	1915	Trumbull Steel Co.	Warren, Ohio	W
109	1800	240	2200	60 cy.	Sheet Mill	Geared	1920	Apollo Steel Co.	Apollo, Pa.	GE
110	1800	253	2200	60	Eight Stand Tin Mill	Coupled	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	AC
111	1800	270	2200	60 cy.	Sheet Mill	Geared	1916	Andrews Steel Co.	Newport, Ky.	W
112	1800	270	2200	60 cy.	Sheet Mill	Geared	1916	Andrews Steel Co.	Newport, Ky.	W
113	2000	234	2200	60 cy.	Sheet Mill	Geared	1919	Newton Steel Co.	Newton Falls, Ohio	W
114	2000	235	2200	60 cy.	Tin Mill	Geared	1920	Nat. Enameling & Stamping Co.	St. Louis, Mo.	W
115	2000	234	2200	60 cy.	Sheet Mill	Geared	1921	Newton Steel Co.	Newton Falls, Ohio	W
116	2000	234	2200	60 cy.	Sheet Mill	Geared	1923	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
117	2000	240	2200	60 cy.	Sheet Mill	Geared	1919	Republic Iron & Steel Co.	Niles, Ohio	GE
118	2000	250	6600	25 cy.	Sheet Mill	Geared	1920	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
119	2000	250	6600	25 cy.	Sheet Mill	Geared	1920	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
120	2000	600	6600	60 cy.	Sheet Mill	Geared	1924	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	GE

ROD MILL DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300	575	2200	60 cy.	Rod Mill	Geared	1923	Standard Underground Cable Co.	Perth Amboy, N. J.	W
2	300	720	2200	60 cy.	Wire Rod Mill.	Geared		Rome Wire Co.	Rome, N. Y.	AC
3	350	250	2200	25 cy.	10" Rod Mill	Direct	1911	Dillworth Porter Co.	Pittsburgh, Pa.	GE
4	360	300–425	230	d.c.	8" Rod Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
5	360	300–600	230	d.c.	Rod Mill	Direct	1922	United Alloy Steel Corporation	Canton, Ohio	W
6	360	350–500	230	d.c.	7" Rod Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
7	450	400–650	230	d.c.	Rod Mill	Direct	1913	American Steel & Wire Co.	Worcester, Mass.	W
8	600	440	2200	60 cy.	10" Rod Mill	Direct	1917	Wickwire Spencer Steel Corp.	Palmer, Mass.	W
9	600–400	514–300	2200	60 cy.	Rod Mill	Direct	1912	Oliver Iron & Steel Co.	Pittsburgh, Pa.	GE
10	700	1200	6600	60	Wire Rod Mill		1925	Weirton Steel Co.	Weirton, W. Va.	AC
11	800	257	2200	60 cy.	12" Rod Mill	Belt	1915	Crucible Steel Co. of America	Harrison, N. J.	GE
12	800–363	706–320	600	d.c.	10" Rod Mill	Geared	1922	Wheeling Steel Corporation	Portsmouth, Ohio	GE
13	800–363	706–320	600	d.c.	10" Rod Mill	Geared	1922	Wheeling Steel Corporation	Portsmouth, Ohio	GE
14	800–363	706–320	600	d.c.	10" Rod Mill	Geared	1922	Wheeling Steel Corporation	Portsmouth, Ohio	GE
15	975–325	650–250	600	d.c.	Rod (Roughing) Mill	Geared	1922	Atlantic Steel Co.	Altanta, Ga.	W
16	975–510	865–450	600	d.c.	Rod (Finishing) Mill	Direct & Belted	1922	Atlantic Steel Co.	Atlanta, Ga.	W
17	1000	720	6600	60	Rod Mill	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
18	1000	720	6600	60	Rod Mill	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
19	1180–955–705	560–450–336	2200	60 cy.	Rod Mill	Belt	1916	Keystone Steel & Wire Co.	Peoria, Ill.	GE
20	1200	360	2200	60 cy.	Morgan Wr. Rod Mill	Geared		Interstate Iron & Steel Co.	Chicago, Ill.	AC
21	1250	175–400	230	d.c.	Rod Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
22	1250–1000–650	650–500–325	2200	25 cy.	Rod Mill	Belt	1916	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
23	1300	500	6400	25 cy.	Rod (Finishing) Mill	Rope	1910	American Steel & Wire Co.	Birmingham, Ala.	W
24	1500	150	6600	25 cy.	Wire Rod Mill	Coupled		Illinois Steel Co.	Joliet, Ill.	AC
25	1500	234	2200	60 cy.	10" Rod Mill	Geared	1921	Columbia Steel Co.	Pittsburgh, Cal.	W
26	1500	270	2200	60 cy.	Lamberton Rod Mill	Geared	1915	United Alloy Steel Corporation	Canton, Ohio	W
27	1500	450–550	600	d.c.	Rod Mill	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
28	1 500	470–510	230	d.c.	Rod Mill	Direct	1923	John A. Roebling Sons	New York, N. Y.	W
29	1600	210–420	525	d.c.	Rod Mill	Geared	1913	Steel Company of Canada	Hamilton, Ont.	W

ROD MILL DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Current	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
30	1600	210–420	525	d.c.	Rod Mill	Geared	1913	Steel Company of Canada	Hamilton, Ont.	W
31	1600	500	6600	25 cy.	Rod (Finishing) Mill	Rope	1910	American Steel & Wire Co.	Birmingham, Ala.	W
32	1800	514	2200	60 cy.	Rod Mill	Geared	1923	Columbia Steel Co.	Pittsburgh, Cal.	GE
33	1850	575–221	600	d.c.	Rod Mill	Direct & Belted	1922	Atlantic Steel Co.	Atlanta, Ga.	W
34	2360–1880–1440	410–327–250	2200	60 cy.	Rod Mill	Geared	1916	Keystone Steel & Wire Co.	Peoria, Ill.	GE
35	2400	500	6600	25 cy.	Wire Rod Mill	Geared		Illinois Steel Co.	Gary, Ind.	AC
36	2470–1725–1235	430–300–215	2200	25 cy.	Rod Mill	Geared	1916	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
37	2600	81.5	6600	25 cy.	Rod (Roughing) Mill	Geared	1910	American Steel & Wire Co.	Birmingham, Ala.	W
38	2600	368	6400	25 cy.	Rod Mill	Geared	1916	American Steel & Wire Co.	Cleveland, Ohio	W
39	2870–1435	400–200	600	d.c.	10″ Rod Mill	Geared	1922	Wheeling Steel Corporation	Portsmouth, Ohio	GE
40	3000	150	6600	25 cy.	Wire Rod Mill	Coupled		Minnesota Steel Co.	Steelton, Minn.	AC
41	3000	450	6600	60	Rod Mills	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
42	3000	450	6600	60	Rod Mills	Geared	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
43	4000	375	6600	25	10″ Cont. Wire Rod Mill	Geared	1925	Bethlehem Steel Co.	Sparrows Point, Md.	GE

PIERCING MILL DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300	300	2200	60	Piercing Mill	Coupled	1917	Pittsburgh Steel Products Co.	Monessen, Pa.	CW
2	300	300	2200	60	Piercing Mill	Coupled	1918	Pittsburgh Steel Products Co.	Allenport, Pa.	CW
3	400	600	440	60 cy.	Billet Piercing Machine	Geared	1915	Chase Metal Works	Waterbury, Conn.	GE
4	400	600	400	60 cy.	Piercing Mill	Geared	1915	Chase Metal Works	Waterbury, Conn.	GE
5	450	720	2200	60 cy.	Piercing Mill	Geared	1924	Standard Seamless Tube Co.	Economy, Pa.	GE
6	500	360	2200	60 cy.	Billet Piercing Mill	Geared	1922	Weldless Tube Co.	Wooster, Ohio	GE
7	500	500	2200	25	Continuous Tube Mill	Coupled	1915	Pittsburgh Steel Products Co.	Monessen, Pa.	CW
8	600	485	550	25 cy.	Piercing Mill	Geared	1915	Baltimore Tube Co.	Baltimore, Md.	W
9	650	225–400	600	d.c.	Piercing Mill	Geared	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
10	650	225–400	600	d.c.	Piercing Mill	Geared	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
11	650	225–400	600	d.c.	Piercing Mill	Geared	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
12	700	150	2200	60 cy.	Piercing Mill	Rope	1916	Ohio Seamless Tube Co.	Shelby, Ohio	GE
13	750 750	235–325	230	d.c.	Piercing Mill	Geared	1914	Pittsburgh Seamless Tube Co.	Beaver Falls, Pa.	GE
14	750	353	2200	60 cy.	Piercing Mill	Direct	1915	National Tube Co.	Elwood City, Pa.	W
15	750	353	2200	60 cy.	Piercing Mill	Direct	1915	National Tube Co.	Elwood City, Pa.	W
16	750	353	2200	60 cy.	Piercing Mill	Direct	1915	National Tube Co.	Elwood City, Pa.	W
17	800	200–300	500	d.c.	Piercing Mill	Rope	1912	Pittsburgh Steel Products Co.	Monessen, Pa.	W
18	800	200–300	500	d.c.	Piercing Mill	Direct	1913	Pittsburgh Steel Products Co.	Monessen, Pa.	W
19	800	250	2200	60 cy.	Piercing Mill	Geared	1915	Timken Roller Bearing Co.	Canton, Ohio	W
20	1000	375	6600	25	Piercing Mill	Geared	1925	National Tube Co.	Lorain, Ohio	AC
21	1000	450	2200	60 cy.	Piercing Mill	Geared		Winchester Rep. Arms Co.	Bridgeport, Conn.	AC
22	1200	200	2200	60 cy.	Piercing Mill	Rope	1919	Ohio Seamless Tube Co.	Shelby, Ohio	GE
23	1600	600	2200	60 cy.	Piercing Mill	Geared	1921	Standard Seamless Tube Co.	Pittsburgh, Pa.	GE
24	2500	247	6600	25 cy.	Piercing Mill	Geared	1923	Gary Tube Company	Gary, Ind.	W
25	2500	247	6600	25	Seamless Tube Mill	Geared	1925	Gary Tube Company	Gary, Ind.	W
26	2500	257	2200	60	Piercing Mill	Geared	1925	Globe Steel Tube Co.	Milwaukee, Wis.	AC
27	3000	40–100	600	d.c.	Piercing Mill	Direct	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
28	3000	125–200	600	d.c.	Piercing Mill	Direct	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
29	3500	600	2200	60	Piercing Mill	Geared	1925	Standard Seamless Tube Co.	Economy, Pa.	GE

TUBE ROLLING MILL DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300	300	230	d.c.	Steel Mill	Geared	1925	National Tube Co.	Lorain, Ohio	AC
2	300	300	230	d.c.	Steel Mill	Geared	1925	National Tube Co.	Lorain, Ohio	AC
3	300	300	230	d.c.	Steel Mill	Geared	1925	National Tube Co.	Lorain, Ohio	AC
4	300	345–500	500	d.c.	Tube Rolling Mill	Geared	1912	Pittsburgh Steel Products Co.	Monessen, Pa.	W
5	300	350	2200	60 cy.	Seamless Tube Co.	Geared	1915	Timken Roller Bearing Co.	Canton, Ohio	W
6	300	350	2200	60 cy.	Tube Rolling Mill	Geared	1919	Timken Roller Bearing Co.	Canton, Ohio	W
7	300	350–450	230	d.c.	Lap Welding Mill	Coupled		Gary Tube Co.	Gary, Ind.	AC
8	300	435	230	d.c.	12″ Pipe Mill	Coupled	1910	A. M. Byers Company	Pittsburgh, Pa.	CW
9	300	435	230	d.c.	12″ Pipe Mill	Coupled	1910	A. M. Byers Company	Pittsburgh, Pa.	CW
10	300	450	220	30 cy.	Lap Welding Rolls	Geared	1923	Spang Chalfant Co.	Etna, Pa.	GE
11	300	450	2200	60 cy.	Cross Rolls in Tube Mill	Geared	1924	Standard Seamless Tube Co.	Economy, Pa.	GE
12	300	450	2200	60 cy.	Cross Rolls in Tube Mill	Geared	1924	Standard Tube Co. Seamless	Economy, Pa.	GE
13	300	500	550	25 cy.	Tube Rolling Mill	Geared	1917	Baltimore Tube Co.	Baltimore, Md.	W
14	300	500	550	25 cy.	Tube Rolling Mill	Geared	1917	Baltimore Tube Co.	Baltimore, Md.	W
15	300	500	230	d.c.	Pipe Mill—Wld. Rolls	Geared	1925	Central Tube Co.	Economy, Pa.	GE
16	300	514	220	60 cy.	Tube Mill	Geared	1914	Detroit Seamless Tube Co.	Detroit, Mich.	GE
17	300	514	440	60 cy.	Tube Mill	Geared	1914	Detroit Seamless Tobe Co.	Detroit, Mich.	GE
18	300	514	220	60 cy.	Tube Mill	Geared		Detroit Seamless Tube Co.	Detroit, Mich.	AC
19	300	600	2200	60 cy.	Tube Mill	Geared	1922	Weldless Tube Co.	Wooster, Ohio	GE
20	300	600	2200	60 cy.	Tube Mill	Geared	1922	Weldless Tube Co.	Wooster, Ohio	GE
21	340	85	230	d.c.	Welding Rolls	Coupled	1906	National Tube Company	McKeesport, Pa.	CW
22	350–350	360–450	230	d.c.	Welding Rolls	Direct	1920	National Tube Co.	Lorain, Ohio	GE
23	350–350	360–450	230	d.c.	Welding Rolls	Direct	1920	National Tube Co.	Lorain, Ohio	GE
24	350	435	2200	60 cy.	Pipe Welding Roll Mill	Geared	1919	Wheeling Steel Corporation	Steubenville, Ohio	W
25	400	75	230	d.c.	Welding Rolls	Coupled	1906	National Tube Company	McKeesport, Pa.	CW
26	400	375	220	25 cy.	Tube Mill—Chill Rolls	Geared	1909	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
27	400	375	220	25 cy.	20″ Tube Mill—Wld. Rolls	Geared	1909	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
28	400	375	220	25 cy.	Tube Mill—Wld. Rolls	Geared	1917	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
29	400	375	220	25 cy.	Tube Mill—Wld. Rolls	Geared	1922	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
30	400	375	220	25 cy.	Tube Mill—Wld. Rolls	Geared	1922	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
31	400	400	440	60 cy.	Lap Welding Rolls	Geared	1923	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
32	400	400	440	60 cy.	Lap Welding Rolls	Geared	1923	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
33	400	435	400	60 cy.	Pipe Mill	Geared	1918	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
34	400	600	440	60 cy.	Tube Mill	Geared		Globe Seamless Tube Co.	Milwaukee, Wis.	AC
35	450	300	230	d.c.	10″ Tube Mill	Coupled	1911	Pittsburgh Seamless Tube Co.	Beaver Falls, Pa.	CW
36	500	234	2200	60	Tube Mill	Coupled	1922	Pittsburgh Steel Products Co.	Allenport, Pa.	CW
37	500	234	2200	60	Tube Mill	Coupled	1922	Pittsburgh Steel Products Co.	Allenport, Pa.	CW
38	500	250	2200	60	Tube Mill	Coupled	1918	Pittsburgh Steel Products Co.	Allenport, Pa.	CW
39	500	250	2200	60	Tube Mill	Coupled	1918	Pittsburgh Steel Products Co.	Allenport, Pa.	CW

TUBE ROLLING MILL DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
40	500	300–450	230	d.c.	Lap Welding Mill	Coupled		Gary Tube Co.	Gary, Ind.	AC
41	500	450	2200	60 cy.	Tube Mill	Geared	1916	Ohio Seamless Tube Co.	Shelby, Ohio	GE
42	500	450	2200	60 cy.	Tube Mill	Geared	1919	Ohio Seamless Tube Co.	Shelby, Ohio	GE
43	500	500	550	25 cy.	Tube Rolling Mill	Geared	1917	Baltimore Tube Co.	Baltimore, Md.	W
44	500	600	2200	60	Reducing Pipe Mill	Geared	1925	Ohio Seamless Tube Co.	Shelby, Ohio	GE
45	600	300		60	Tube Mill	Coupled	1917	Pittsburgh Steel Products Co.	Monessen, Pa.	CW
46	600	300		60	Tube Mill	Coupled	1918	Pittsburgh Steel Products Co.	Allenport, Pa.	CW
47	600	360	2200	60 cy.	Tube Mill	Geared	1914	Standard Seamless Tube Co.	Economy, Pa.	GE
48	700	300–400	230	d.c.	Lap Welding Mill	Coupled		Gary Tube Co.	Gary, Ind.	AC
49	750	295	6600	25 cy.	Seamless Mill	Geared	1923	Gary Tube Co.	Gary, Ind.	W
50	750	353	2200	60 cy.	Tube Rolling Mill	Direct	1915	National Tube Co.	Ellwood City, Pa.	W
51	750	353	2200	60 cy.	Tube Rolling Mill	Direct	1915	National Tube Co.	Ellwood City, Pa.	W
52	750	353	2200	60 cy.	Tube Rolling Mill	Direct	1915	National Tube Co.	Ellwood City, Pa.	W
53	800	107	6600	25	Tube Rolling Mill	Coupled	1925	National Tube Co.	Lorain, Ohio	AC
54	800	109	2200	60 cy.	2—21″ Rolls	Coupled	1924	Globe Steel Tube Co.	Milwaukee, Wis.	AC
55	800	225	2200	60 cy.	Roughing Mill Tube	Geared	1916	Standard Seamless Tube Co.	Economy, Pa.	GE
56	1000	240	220	60 cy.	Tube Mill	Geared		Globe Seamless Tube Co.	Milwaukee, Wis.	AC
57	1000	240		60	Tube Mill		1917	Pittsburgh Seamless Tube Co.	Beaver Falls, Pa.	CW
58	1000	300–400	230	d.c.	Lap Welding Mill	Coupled		Gary Tube Co.	Gary, Ind.	AC
59	1200	257	4600	60 cy.	Tube Mill	Rope Drive & Coupled		Detroit Seamless Tube Co.	Detroit, Mich.	GE
60	1200	294	2200	60 cy.	Tube Rolling Mill	Geared	1915	National Tube Co.	Ellwood City, Pa.	W
61	1800	250	2200	60 cy.	Tube Rolling Mill	Direct	1915	National Tube Co.	Ellwood City, Pa.	W

STRIP AND HOOP MILL DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300–225–165	335–225–165	6600	25 cy.	12″ Hot Strip Mill	Geared	1920	Illinois Steel Co.	Gary, Ind.	GE
2	300	360		60	10″ Strip Mill	Coupled	1923	Pittsburgh Steel Company	Glassport, Pa.	CW
3	300	600	2200	60 cy.	10″ Hot Strip Mill	Direct	1919	Superior Steel Co.	Carnegie, Pa.	GE
4	350	242	2200	25 cy.	Cold Strip Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	W
5	350	345	440	60 cy.	21″ Plate (Cold Roll.) Mill	Geared	1910	Oliver Iron & Steel Co.	Wilson Station, Pa.	W
6	350	490	6400	25 cy.	24″ Flat (Edging) Mill	Geared	1916	American Steel & Wire Co.	Cleveland, Ohio	W
7	400–400	275–500	550	d.c.	12″ Hot Strip Mill	Direct	1916	American Steel & Wire Co.	Cleveland, Ohio	GE
8	400	360		60	8″ Strip Mill	Coupled	1923	Pittsburgh Steel Company	Glassport, Pa.	CW
9	450	440–350	2200	60 cy.	Cont. Hoop (Fin.) Mill	Direct	1920	Connors Steel Co.	Birmingham, Ala.	W
10	450	450–600	230	d.c.	12″ Cold Strip (2 Tandem Stds. Roughing) Mill	Geared	1915	Superior Steel Co..	Carnegie, Pa.	W
11	450	450–600	230	d.c.	12″ Cold Strip (2 Tandem Stds. Finishing) Mill	Geared	1915	Superior Steel Co.	Carnegie, Pa.	W
12	450	700–595	2200	60 cy.	Cont. Hoop (Fin.) Mill	Direct	1920	Connors Steel Co.	Birmingham, Ala.	W
13	450	730	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
14	450	730	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
15	500–500	250–325	230	d.c.	8″ Hoop Mill	Direct	1909	Atlantic Steel Co.	Atlanta, Ga.	GE
16	500	250–500	230	d.c.	9″ Hoop (Finishing) Mill	Direct	1914	Sharon Steel Hoop Co.	Sharon, Pa.	W
17	500–500	400–600	230	d.c.	Hoop Mill	Geared	1920	Atlantic Steel Co.	Atlanta, Ga.	GE
18	500	450		60	Hoop Mill	Geared	1912	Carnegie Steel Company	Pittsburgh, Pa.	CW
19	550	320–206	2200	60 cy.	10″ Hoop Mill	Direct	1917	Atlantic Steel Co.	Atlanta, Ga.	W
20	600–600	150–250	575	d.c.	6″ Hot Strip Mill	Direct	1913	American Steel & Wire Co.	Cleveland, Ohio	GE
21	600–600	225–425	550	d.c.	12″ Hot Strip Mill	Direct	1916	American Steel & Wire Co.	Cleveland, Ohio	GE
22	600	390	440	60 cy.	Cold Strip Mill	Geared	1917	Stanley Works	New Haven, Conn.	W
23	600–600	720–360	6600	60 cy.	Hot Strip Mill	Geared		Weirton Steel Co.	Weirton, W. Va.	AC
24	700	490	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
25	700	490	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
26	700	875	2200	60 cy.	Cont. Hoop (Rough.) Mill	Geared	1920	Connors Steel Co.	Birmingham, Ala.	W
27	700	875	2200	60 cy.	Cont. Hoop (Inter.) Mill	Geared	1920	Connors Steel Co.	Birmingham, Ala.	W
28	750	257		60	10″ Strip Mill	Coupled	1923	Pittsburgh Steel Company	Glassport, Pa.	CW
29	750–625–460	360–300–220	6600	25 cy.	12″ Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
30	750–750	360–860	600	d.c.	14″ Cont. Mill	Geared	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
31	750–600–400	473–375–278	6600	25 cy.	12″ Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
32	770–700–630	540–490–440	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
33	800–800	200–400	600	d.c.	14″ Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
34	800–800	214–167	6600	25 cy.	16″ Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
35	800–800	231–462	600	d.c.	14″ Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
36	800	250–500	230	d.c.	14″ and 9″ Hoop Mill	Direct	1914	Sharon Steel Hoop Co.	Sharon, Pa.	W
37	800–800	256–512	600	d.c.	14″ Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
38	800–800	275–550	600	d.c.	14″ Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
39	800–800	315–210	575	d.c.	6″ Hot Strip Mill	Direct	1907	American Steel & Wire Co.	Cleveland, Ohio	GE
40	800–800	390–260	575	d.c.	6″ Hot Strip Mill	Direct	1907	American Steel & Wire Co.	Cleveland, Ohio	GE
41	800	435	2200	60	No. 2 Hoop Mill	Geared	1925	Connors Steel Co.	Birmingham, Ala.	W
42	800	585–292	6600	60 cy.	16″ Hoop and Band Mill	Geared	1915	Weirton Steel Co.	Weirton, W. Va.	W
43	800–800–800	720–600–480	2200	60 cy.	12″ Hot Strip Mill	Geared	1920	Canadian Electric Steel Co.	Montreal, Canada	GE
44	800–800–800	720–600–480	2200	60 cy.	12″ Hot Strip Mill	Geared	1920	Canadian Electric Steel Co.	Montreal, Canada	GE
45	900–710–620	325–257–182	2300	60 cy.	10″ Hoop Mill	Geared	1918	Acme Steel Goods Co.	Riverdale, Ill.	GE
46	1000	50–100	600	d.c.	24″ Flat (Rough.) Mill	Direct	1916	American Steel & Wire Co.	Cleveland, Ohio	W
47	1000	214–150	6400	25 cy.	24″ Flat (Finishing) Mill	Direct	1916	American Steel & Wire Co.	Cleveland, Ohio	W
48	1000	705	2200	60 cy.	16″ Strip Mill	Geared	1920	Central Steel Co.	Massillon, Ohio	W
49	1125–900–675	312–250–187	6600	25	12″ Strip Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
50	1200–1200–1200	450–360–270	2300	60 cy.	9″ Hot Strip Mill	Geared	1916	Trumbull Steel Co.	Warren, Ohio	GE
51	1200–1200–1200	450–360–270	2300	60 cy.	9″ Hot Strip Mill	Geared	1916	Trumbull Steel Co.	Warren, Ohio	GE
52	1200–1200–1200	450–360–270	2300	60 cy.	9″ Hot Strip Mill	Direct	1916	Trumbull Steel Co.	Warren, Ohio	GE
53	1200–1000–800	450–375–300	6600	25 cy.	8″ Hoop Mill, No. 8	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
54	1200–1000–800	450–375–300	6600	25 cy.	8″ Hoop Mill, No. 9	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
55	1200–1000–800	450–375–300	6600	25 cy.	18″ Band Mill, No. 13	Geared	1919	Carnegie Steel Co.	Youngstown, Ohio	GE
56	1200	505–303	6600	60 cy.	16″ Band Mill	Geared	1919	Weirton Stee Co.	Weirton, W. Va.	W
57	1200	590–450	2200	60 cy.	Duo and Bull Head Mill	Geared	1916	Central Steel Co.	Massillon, Ohio	W
58	1200	590	2200	60 cy.	22″ Strip Mill	Geared	1918	Harrisburg Pipe & Pipe Bending Co.	Harrisburg, Pa.	W
59	1250–1250	175–350	600	d.c.	14″ Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
60	1250–1250	175–350	600	d.c.	14″ Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
61	1500	125–250	230	d.c.	14″ Band Mill	Direct	1914	Sharon Steel Hoop Co.	Sharon, Pa.	W
62	1500	125–250	240	d.c.	Strip Mill	Geared	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
63	1500	125–250	240	d.c.	Strip Mill	Geared	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
64	1500	200–400	600	d.c.	20″–16″ Hot Strip Mill	Geared	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
65	1500	257	2200	25 cy.	10″ Hot Strip Mill	Direct	1919	Superior Steel Co.	Carnegie, Pa.	GE
66	1500–1500	280–420	600	d.c.	20″ Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
67	1500–1500	280–420	600	d.c.	20″ Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
68	1500–1500	280–420	600	d.c.	20″ Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
69	1500	360	2200	60 cy.	10″ Hot Strip Mill	Direct	1919	Superior Steel Co.	Carnegie, Pa.	GE

STRIP AND HOOP MILL DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
70	1500–1200–1500	450–360–270	2300	60 cy.	16″ Strip Mill	Geared	1916	Trumbull Steel Co.	Warren, Ohio	GE
71	1500–1200–900	468–375–281	6600	25	12″ Strip Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
72	1500	505	6600	60 cy.	16″ Hoop and Band Mill	Geared	1915	Weirton Steel Co.	Weirton, W. Va.	W
73	1500	514	6600	60 cy.	Hot Strip Mill	Geared		Weirton Steel Co.	Weirton, W. Va.	AC
74	1500–1500	514–237	6600	60 cy.	Hot Strip Mill	Geared		Weirton Steel Co.	Weirton, W. Va.	AC
75	1500	514	6600	60 cy.	Hot Strip Mill	Geared	1924	Weirton Steel Co.	Weirton, W. Va.	AC
76	1500–1500	514–237	6600	60 cy.	Hot Strip Mill	Geared		Weirton Steel Co.	Weirton, W. Va.	AC
77	1500	705	2200	60 cy.	Strip Mill	Geared	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
78	1500	705	2200	60 cy.	Strip Mill	Geared	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
79	1500	705	2200	60	20″–16″ Hot Strip Mill	Geared	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
80	1600	440–500–540	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
81	1600	440–500–540	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
82	1600	490	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
83	1650–1205	235–187.5–	6600	25 cy.	20″ Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
84	1700–1700	90–140	600	d.c.	14″ Continuous Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
85	1700–1700	90–205	600	d.c.	14″ Continuous Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
86	1800–1800	115–230	600	d.c.	20″ Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
87	1800–1800	115–230	600	d.c.	20″ Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
88	1800–1800	115–230	600	d.c.	20″ Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
89	1800	125–250	600	d.c.	20″–16″ Hot Strip Mill	Direct	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
90	1800	125–250	600	d.c.	20″–16″ Hot Strip Mill	Direct	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
91	1800	165–350	240	d.c.	Strip Mill	Direct	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
92	1800	165–350	240	d.c.	Strip Mill	Direct	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
93	1800	185–370	600	d.c.	20″–16″ Hot Strip Mill	Geared	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
94	1800	185–370	600	d.c.	20″–16″ Hot Strip Mill	Direct	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
95	1800	185–370	600	d.c.	20″–16″ Hot Strip Mill	Direct	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
96	1800	214	2200	25 cy.	6″ Hot Strip Mill	Rope	1907	American Steel & Wire Co.	Cleveland, Ohio	GE
97	1800–1500–1200	240–200–160	2300	60 cy.	10″ Hoop Mill	Belt	1918	Acme Steel Goods Co.	Riverdale, Ill.	GE
98	1800–1500–1200	450–375–300	6600	25 cy.	10″ Hoop Mill, No. 11	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
99	1800	500	6600	25 cy.	20″ Hot Strip Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	GE
100	2000–1700	210–680	600	d.c.	14″ Continuous Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
101	2000–2000–1600	450–360–270	2200	60 cy.	16″ Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
102	2000–2000–1600	450–360–270	2200	60 cy.	16″ Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
103	2000–2000–1600	450–360–270	2200	60 cy.	16″ Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
104	2000–1600–1200	625–500–375	6600	25	12″ Strip Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
105	2000–1600–1200	625–500–375	6600	25	14″ Bar Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
106	2100–2100	150–310	600	d.c.	14″ Cont. Strip Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
107	2100–1600	150–460	600	d.c.	14″ Cont. Strip Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
108	2200–2000–1800	275–250–225	6600	25	18″ Band Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
109	2500	187.5	6600	25	18″ Band Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
110	2500	187.5	6600	25	18″ Band Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
111	2500	352–176	6600	60 cy.	16″ Hoop and Band Mill	Geared	1915	Weirton Steel Co.	Weirton, W. Va.	W
112	2750–2240–1750	262–214–167	6600	25 cy.	12″ Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
113	3000	125	6400	25 cy.	20″ Flat Mill	Coupled		American Steel & Wire Co.	Cleveland, Ohio	AC
114	3000–3000	200–360	600	d.c.	14″ Continuous Mill	Geared	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
115	3000–2500–2000	300–250–200	6600	25 cy.	18″ Band Mill, No. 13	Direct	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
116	3000–2500–2000	300–250–200	6600	25 cy.	12″ Hoop Mill, No. 13	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
117	5000–4000–3000	450–360–270	2200	60	16″ Hot Strip Mill	Geared	1925	Trumbull Steel Co.	Warren, Ohio	GE
118	5500–4400–3400	170–136–105	6600	25 cy.	20″ Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE

COLD ROLL DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300	300	230	d.c.	Cold Roll Mill	Geared	1914	Trumbull Steel Co.	Warren, Ohio	W
2	300	300	230	d.c.	Cold Roll Mill	Geared	1920	Alan Wood Iron & Steel Co.	Conshohocken, Pa.	W
3	300	340	2200	60 cy.	Cold Roll Mill	Geared	1921	Newton Steel Co.	Newton Falls, Ohio	W
4	300	350	2200	60 cy.	Cold Roll Mill	Geared	1915	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	W
5	300	350	2200	60 cy.	Cold Roll Mill	Geared	1916	Wheeling Steel Corporation	Wheeling, W. Va.	W
6	300	350	2200	60 cy.	Cold Roll Mill	Geared	1916	Wheeling Steel Corporation	Portsmouth, Ohio	W
7	300	350	2200	60 cy.	Cold Roll Mill	Geared	1916	Wheeling Steel Corporation	Portsmouth, Ohio	W
8	300	350	2200	60 cy.	Cold Roll Mill	Geared	1916	Wheeling Steel Corporation	Portsmouth, Ohio	W
9	300	350	2200	60 cy.	Cold Roll Mill	Geared	1916	Wheeling Steel Corporation	Portsmouth, Ohio	W
10	300	352	2200	60 cy.	Cold Roll Mill	Direct	1923	Sharon Steel Hoop Co.	Youngstown, Ohio	W
11	300	353	2200	60 cy.	Cold Rolls	Geared		Reeves Mfg. Co.	Dover, Ohio	GE
12	300	360	2200	60 cy.	Sheet Mill—Cold Rolls	Geared	1922	U. Alloy Steel Corp., Berger Div.	Canton, Ohio	GE
13	300	360	2300	60 cy.	Cold Rolls	Geared	1923	Ashtabula Steel Co.	Ashtabula, Ohio	GE
14	300	363	220	25 cy.	Cold Roll Mill	Geared	1919	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
15	300–300	400–800	230	d.c.	Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
16	300–300	400–800	230	d.c.	Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
17	300–300	400–800	230	d.c.	Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
18	300–300	400–800	230	d.c.	Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
19	300–300	400–800	230	d.c.	20x24″ Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE
20	300–300	400–800	230	d.c.	20x24″ Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE
21	300–300	400–800	230	d.c.	20x24″ Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE
22	300–300	400–800	230	d.c.	20x24″ Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE
23	300	440	2200	60 cy.	Cold Roll Mill	Geared	1924	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
24	300	440	2200	60 cy.	Cold Roll Mill	Geared	1924	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
25	300	485	2200	25 cy.	Cold Roll Mill	Direct	1916	Halcomb Steel Co.	Syracuse, N. Y.	W
26	300	514	550	60 cy.	14″ Cold Strip Mill	Geared	1922	Wallingford Steel Co.	Wallingford, Conn.	GE
27	300	575	2200	60 cy.	Cold Roll Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
28	300	575	2200	60 cy.	Cold Roll Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
29	300	575	2200	60 cy.	Cold Roll Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
30	300	575	2200	60 cy.	Cold Roll Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
31	300	600	2200	60 cy.	Cold Sheet Mill Rolls	Geared	1923	Falcon Steel Co.	Niles, Ohio	GE
32	350	145	2200	60 cy.	Cold Roll Mill	Rope	1912	Massillon Rolling Mill Co.	Massillon, Ohio	W
33	350	345	440	60 cy.	Cold Roll Mill	Geared	1910	Oliver Iron & Steel Co.	Wilson, Pa.	W
34	350	360	2200	60 cy.	Sheet Mill—Cold Rolls	Geared	1919	Falcon Steel Co.	Niles, Ohio	GE
35	375	430–860	230	d.c.	20″ Cold Roll Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	W
36	375	430–860	230	d.c.	20″ Cold Roll Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	W
37	375	430–860	230	d.c.	20″ Cold Roll Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	W
38	375	430–860	230	d.c.	20″ Cold Roll Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	W
39	375	430–860	230	d.c.	20″ Cold Roll Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	W
40	375	430–860	230	d.c.	Cold Strip Mill	Geared	1925	Otis Steel Co.	Cleveland, Ohio	GE
41	375	430–860	230	d.c.	Cold Strip Mill	Geared	1925	Otis Steel Co.	Cleveland, Ohio	GE
42	400	290	2200	60 cy.	Cold Roll Mill	Geared	1916	Youngstown Sheet & Tube Co.	Warren, Ohio	W
43	400	290	2200	60 cy.	Cold Roll Mill	Geared	1917	Liberty Steel Co.	Warren, Ohio	W
44	400	360	2200	60 cy.	Sheet Mill, Cold Rolls	Geared	1916	Mahoning Valley Steel Co.	Niles, Ohio	GE
45	400	360	2200	60 cy.	Sheet Mill, Cold Rolls	Geared	1916	Mahoning Valley Steel Co.	Niles, Ohio	GE
46	400	360	2200	60 cy.	Cold Roll Sheet Mill	Geared	1918	Reeves Mfg. Co.	Canal Dover, Ohio	GE
47	400	360	440	60 cy.	Cold Strip Mill	Geared	1921	Am. Tube and Stamping Co.	Bridgeport, Conn.	GE

COLD ROLL DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
48	400	575	2200	60 cy.	Cold Roll Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
49	400	575	2200	60 cy.	Cold Roll Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
50	400	575	2200	60 cy.	Cold Roll Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
51	400	575	2200	60 cy.	Cold Roll Mill	Geared	1922	American Rolling Mill Co.	Ashland, Ky.	W
52	450	375	440	25	Cold Roll Mill	Geared	1925	Seneca Iron & Steel Co.	Blasdell, N. Y.	CW
53	450	514	550	60 cy.	14″ Cold Strip MillP	Geared	1922	Wallingford Steel Co.	Wallingford, Conn.	GE
54	500	250	6600	25 cy.	Sheet Mill Cold Rolls	Geared	1919	Bethlehem Steel Co.	Sparrows Point, Md.	GE
55	500	350	2200	60 cy.	Cold Roll Mill	Geared	1916	Mansfield Sheet & Tin Plate Co.	Mansfield, Ohio	W
56	500	350	440	60 cy.	Cold Roll Mill	Geared	1916	Andrews Steel Co.	Newport, Ky.	W
57	500	360	2200	60 cy.	Sheet Mill, Cold Rolls	Geared	1920	Central Steel Co.	Massillon, Ohio	GE
58	500	360	2200	60 cy.	Sheet Mill, Cold Rolls	Geared	1920	Central Steel Co.	Massillon, Ohio	GE
59	500	360	2200	60 cy.	Sheet Mill, Cold Rolls	Geared	1920	Republic Iron & Steel Co.	Youngstown, Ohio	GE
60	500	442	2200	60 cy.	Cold Roll Mill	Geared	1922	Follansbee Brothers Co.	Toronto, Ohio	W
61	500	450	550	60 cy.	12″ Cold Roll Mill	Geared	1914	Worcester Pressed Steel Co.	Worcester, Mass.	GE
62	600	150	550	60 cy.	Sheet Mill, Cold Rolls	Rope	1909	Weirton Steel Co.	Weirton, W. Va.	GE
63	700	502	2200	60 cy.	Cold Roll Mill	Geared	1917	Carnahan Tin Plate & Sheet Co.	Canton, Ohio	W
64	750	100	2200	25 cy.	Tin Mill, Cold Rolls	Geared	1915	American Sheet & Tin Plate Co.	Gary, Ind.	GE
65	750	100	2200	25 cy.	Tin Mill, Cold Rolls	Geared	1915	American Sheet & Tin Plate Co.	Gary, Ind.	GE
66	750	125	2200	25 cy.	Tin Mill, Cold Rolls	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
67	750	125	2200	25 cy.	Tin Mill, Cold Rolls	Rope	1915	McKeesport Tin Plate Co.	McKeesport, Pa.	GE
68	750	240	2200	60 cy.	Sheet Mill, Cold Rolls	Geared	1919	Wheeling Steel Corp.	Stuebenville, Ohio	GE
69	750	300–600	230	d.c.	Cold Rolling Mill	Geared	1924	International Nickel Co.	Huntington, W. Va.	AC
70	800	375	2200	25 cy.	Sheet Mill, Cold Rolls	Geared	1919	Eastern Rolling Mills Co.	Baltimore, Md.	GE
71	1200	367	2200	25 cy.	Cold Roll Mill	Geared	1916	Bethlehem Steel Co.	Sparrows Point, Md.	W

MERCHANT MILL DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300–300	187.5–112.5	2200	25 cy.	12″ Merchant Mill	Direct	1914	Bethlehem Stee Co.	Lebanon, Pa.	GE
2	300–300	187.5–112 5	2200	25 cy.	12″ Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
3	300	225–300	230	d.c.	Marchant (Finishing) Mill	Direct	1919	Pacific Coast Steel Co.	Seattle, Wash.	W
4	300	257	2200	60	Merchant Mill		1917	Tennessee Coa., Iron & R. R. Co.	Bessemer, Ala.	CW
5	300–300	300–180	2200	25 cy.	10″ Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
6	300	300	2200	60	Merchant Mill		1917	Tennessee Coal, Iron & R. R. Co.	Bessemer, Ala.	CW
7	300–300	315–630	230	d.c.	8″ Merchant Mlli	Direct	1919	Donner Steel Co.	Buffalo, N. Y.	GE
8	300	350–500	230	d.c.	Merchant Mill	Coupled	1915	Buffalo Bolt Company	N. Tonawanda, N. Y.	CW
9	300	365	2200	25 cy.	8″ Merchant Mill	Direct	1909	Bethlehem Steel Co.	Johnstown, Pa.	W
10	300	440	2200	60 cy.	Merch. (Roughing) Mill	Coupled		Ft. Wayne Rolling Mill Co.	Ft. Wayne, Ind.	AC
11	300	450	2200	60 cy.	8″ Merchant Mill		1917	Llewellyn Iron Works	Los Angeles, Cal.	GE
12	300–300	500–300	2200	25 cy.	9″ Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
13	300–300	500–300	2200	25 cy.	8″ Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
14	300	500	2080	25 cy.	9″ Merchant Mill	Geared	1916	Halcomb Steel Co.	Syracuse, N. Y.	GE
15	300–150	590–292	2200	60 cy.	9″ Merchant (Fin.) Mill	Geared	1920	Cleveland Hardware Co.	Cleveland, Ohio	W
16	300	600	2200	60 cy.	Merchant Mill	Geared	1916	Tennessee Coal, Iron & R. R. Co.	Bessemer, Ala.	GE
17	300	720	440	60 cy.	14″ Merchant Mill	Geared	1913	Bourne Fuller Co.	Cleveland, Ohio	GE
18	300	720	440	60 cy.	12″ Merchant Mill	Geared	1919	The Stanley Works	New Britain, Conn.	GE
19	300	750	3000	50 cy.	Merchant Mill	Geared	1923	Cons. Rolling Mills Co.	Mexico City, Mex.	GE
20	300–200	920–360	220	d.c.	Merchant Mill	Direct	1919	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
21	350–350	150–100	6600	25 cy.	12″ Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
22	350	200–300	250	d.c.	9″ Merchant Mill	Direct	1919	National Farming Machinery, Ltd.	Montmagny, P. Q.	W
23	350–350	240–480	240	d.c.	10″ Merchant Mill	Direct	1923	LaClede Steel Co.	St. Louis, Mo.	GE
24	350	250–325	230	d.c.	9″ Merchant Mill	Direct	1921	Wayne Steel Co.	Erie, Pa.	W
25	350–235	300–200	6600	25 cy.	Merchant Mill	Geared	1920	Illinois Steel Co.	Gary, Ind.	GE
26	350–350	360–240	240	d.c.	10″ Merchant Mill	Direct	1911	LaClede Steel Co.	St. Louis, Mo.	GE
27	350–350	375–214	6600	25 cy.	9″ Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
28	350	480	2200	25 cy.	12″ Roughing Stand Mill	Geared	1923	Halcomb Steel Co.	Syracuse, N. Y.	W
29	350	420	2200	50 cy.	Merchant Mill	Geared	1919	Southern California Iron & SteelCo.	Los Angeles, Cal.	W
30	350	524–850	230	d.c.	18″ Blading Mill	Geared	1924	W. E. & M. Co.	South Phila. Works	W
31	350	580	2200	60 cy.	Merchant Mill	Geared	1916	Copper Clad Steel Co.	Pittsburgh, Pa.	W
32	350	590	2200	60 cy.	12″ Merchant Mill	Geared	1918	Indianapolis & Eastern TractionCo.	Indianapolis, Ind.	W
33	350	700	2200	60 cy.	Merchant Mill	Geared	1918	Kilby Car & Foundry Co.	Anniston, Ala.	W
34	400	200–300	230	d.c.	9″ Merchant Mill	Direct	1914	United Alloy Steel Corp.	Canton, Ohio	W
35	400	210–350		d.c.	Merchant Mill		1915	Buffalo Bolt Company	N. Tonawanda, N. Y.	CW
36	400–400	250–500	230	d.c.	10″ Merchant Mill	Direct	1920	Timken Roller Bearing Co.	Canton, Ohio	GE
37	400	300	2200	25 cy.	Merchant Mill	Rope	1909	American Steel & Wire Co.	Cleveland, Ohio	GE
38	400	300	2200	25 cy.	Merchant Mill	Rope	1909	American Steel & Wire Co.	Cleveland, Ohio	GE
39	400	300	2500	25 cy.	Merchant Mill	Rope	1909	American Steel & Wire Co.	Cleveland, Ohio	GE
40	400	300	2200	25 cy.	Merchant Mill	Rope	1909	American Steel & Wire Co.	Cleveland, Ohio	GE
41	400–500	300–600	600	d.c.	9″ Finishing Mill	Geared	1921	Driver Harris Co.	Harrison, N. J.	W
42	400	385	550	40 cy.	22″ Puddle Mill	Geared	1917	Cohoes Rolling Mill Co.	Cohoes, N. Y.	W
43	400	400–450	220	d.c.	8″ Merchant Mill	Direct	1911	Illinois Steel Co.	Milwaukee, Wis.	W
44	400	485	440	25 cy.	9″ Merchant Mill	Geared	1915	Hess Steel Corporation	Baltimore, Md.	W
45	400	585	4000	60 cy.	14″ Merchant Mill	Geared	1922	Calumet Steel Co.	Chicago, Ill.	W
46	400	600	440	60 cy.	12″ Merchant Mill	Geared	1919	The Stanley Works	New Britain, Conn.	GE
47	450	354–230	2200	60 cy.	8″ Merchant Mill	Direct	1919	Bourne-Fuller Co.	Cleveland, Ohio	W
48	450	440	2200	60 cy	Merchant Mill	Geared	1920	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
49	450	450	2080	60 cy.	18″ Merchant Mill	Geared	1919	Columbia Steel Co.	Pittsburgh, Cal.	GE
50	450	450	2080	60 cy.	12″ Merchant Mill	Geared	1919	Columbia Steel Co.	Pittsburgh, Cal.	GE
51	450	585	2200	50 cy.	14″ Merchant Mill	Geared	1918	Columbia Steel Co.	Los Angeles, Cal.	W
52	450	730–490	4000	25 cy.	10″ Merchant Mill	Geared	1917	Atlas Steel Corporation	Dunkirk, N. Y.	W
53	450–360	870–695	2200	60 cy.	10″ Merchant Mill	Geared	1913	Cleveland Hardware Co.	Cleveland, Ohio	W
54	450–360	875–700	2200	60 cy.	9″ Merchant Mill	Geared	1915	National Lock Washer Co.	Riverside, N. J.	W
55	475–350	240–181	440	25 cy.	10″ Merchant Mill	Direct	1914	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
56	485–360	870–695	2200	60 cy.	10″ Merchant Mill	Geared	1915	Old Dominion Iron & Nail Co.	Richmond, Va.	W
57	500	88	6600	25 cy.	16″ Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
58	500–385–250	130–100–65	440	25 cy.	14″ Merchant Mill	Direct	1923	Halcomb Steel Co.	Syracuse, N. Y.	GE
59	500	150–225	250	d.c.	12″ Merchant Mill	Direct	1919	National Farming Machinery, Ltd.	Montmagny, P. Q.	W
60	500	184	2200	25 cy.	12″ Merchant Mill	Rope	1905	Ontario Iron & Steel Co.	Welland, Ont.	W
61	500	184	2200	25 cy.	16″ Merchant Mill	Direct	1908	Bethlehem Steel Co.	Johnstown, Pa.	W
62	500	190	230	d.c.	18″ Tandem Mer. (Roughing) Mill	Rope	1910	Sharon Steel Hoop Co.	Sharon, Pa.	GE
63	500	200–400	250	d.c.	10″ Cont. Rolling Mill	Coupled	1925	Republic Iron & Steel Co.	Youngstown, Ohio	AC
64	500–330	242–161	440	25 cy.	16″ and 10″ Merchant Mill	Direct & Rope	1913	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
65	500	244	2200	25 cy.	10″ Merchant Mill	Direct	1908	Bethlehem Steel Co.	Johnstown, Pa.	W
66	500	250–350	600	d.c.	9″ Merchant Mill	Direct	1921	Missouri Rolling Mill Co.	St. Louis, Mo.	W
67	500	292	4000	60 cy.	8″ Merchant Mill	Direct	1920	Calumet Steel Co.	Chicago, Ill.	W
68	500	320	2200	60 cy.	12″ Merchant Mill	Geared	1919	Baltimore & Ohio Railroad	Cumberland, Md.	W
69	500–500	327–200	440	60 cy.	9″ Merchant Mill	Direct	1913	Union Rolling Mills Co.	Cleveland, Ohio	GE

MERCHANT MILL DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
70	500	360	2200	25 cy.	8" Merchant Mill	Direct	1912	Bethlehem Steel Co.	Johnstown, Pa.	W
71	500	435	440	60 cy.	8" Merchant Mill	Rope	1911	Carnegie Steel Co., Painter Mill	Pittsburgh, Pa.	W
72	500	435	440	60 cy.	8" Merchant Mill	Rope	1912	Carnegie Steel Co., Painter Mill	Pittsburgh, Pa.	W
73	500	435	440	60 cy.	8" Merchant Mill	Rope	1912	Carnegie Steel Co., Painter Mill	Pittsburgh, Pa.	W
74	500	435	440	60 cy.	9" Merchant (Fin.) Mill	Belted	1914	Carnegie Steel Co., Painter Mill	Pittsburgh, Pa.	W
75	500	435	440	60 cy.	10" Merchant (Fin.) Mill	Belted	1914	Carnegie Steel Co., Painter Mill	Pittsburgh, Pa.	W
76	500	435	2200	60 cy.	Merchant Mill	Geared	1916	Seymour Manufacturing Co.	Waterbury, Conn.	W
77	500	480-250	230	d.c.	Merchant Mill	Coupled	1923	Buffalo Bolt Company	N. Tonawanda, N. Y.	CW
78	500	450	2300	60 cy.	Merchant Mill	Geared	1916	Pacific Coast Steel Co.	San Francisco, Cal.	GE
79	500	487	6600	25 cy.	8" Merchant Mill	Direct	1913	Minnesota Steel Co.	Duluth, Minn.	W
80	500-500-500	500-375-265	2200	25 cy.	10" Merchant Mill	Direct & Belt	1916	Donner Steel Co.	Buffalo, N. Y.	GE
81	500	500	2300	25 cy.	18" Merchant Mill	Geared	1919	Halcomb Steel Co.	Syracuse, N. Y.	GE
82	500	575-865	2200	60 cy.	10" Merchant Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	W
83	500	575-865	2200	60 cy.	10" Merchant Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	W
84	500	600	2200	60 cy.	Merchant Mill	Geared	1923	Taunton-New Bedf'd Cop. Co.	Taunton, Mass.	GE
85	500-330	730-485	2200	50 cy.	8" Merchant Mill	Geared	1919	Southern California Iron & SteelCo.	Los Angeles, Cal.	W
86	500-250	750-375	3000	50 cy.	Merchant Mill	Geared	1923	Consolidated Rolling Mills Co.	Mexico City, Mex.	GE
87	500-400	775-585	550	40 cy.	10" Merchant Mill	Geared	1917	Cohoes Rolling Mill Co.	Cohoes, N. Y.	W
88	500	870	2200	60 cy.	16" Merchant Mill	Geared	1919	McConway Torley Co.	Pittsburgh, Pa.	W
89	500-400	875-700	550	50 cy.	10" & 14" Merchant Mill	Geared	1916	The Texas Steel Co.	Fort Worth, Tex.	W
90	500	884	2200	50	9" Rougher Mill	Geared	1925	Crucible Steel Co.	Atha Works	W
91	500	888-540	6600	50 cy.	11" Finishing Stand. Mil	Coupled		Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
92	500-250	890-513 440-256	2200	50 cy.	10" Merchant Mill	Geared	1919	Hunter Crucible Steel Co.	Cleveland, Ohio	W
93	500	900	440	60	10" Merchant Mill	Geared	1925	Latrobe Elec. Steel Co.	Latrobe, Pa.	GE
94	525	125	2200	25 cy.	Merchant Mill	Rope	1910	American Sheet & Tin Plate Co.	Gary, Ind.	GE
95	550	120-300	250	d.c.	11" Merchant Mill	Direct	1923	Firth Sterling Steel Co.	McKeesport, Pa.	W
96	550-360	875-585	2200	50 cy.	12" Merchant Mill	Geared	1917	Norfolk & Western Railroad Co.	Roanoke, Va.	W
97	550	880	2200	50 cy.	16" Merchant Mill	Geared	1919	Danville Structural Tube Co.	Danville, Pa.	W
98	550	880	2200	60 cy.	Merchant Mill	Geared	1921	Danville Structural Tube Co.	Danville, Pa.	W
99	575	300-214	6600	25 cy.	10" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
100	575-575	375-250	6600	25 cy.	8" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
101	600	200-300	230	d.c.	9" Merchant Mill	Direct	1914	United Alloy Steel Corporation	Canton, Ohio	W
102	600	200-300	230	d.c.	9" Merchant Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
103	600-600	214-93	6600	25 cy.	12" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
104	600-525	250-125	2200	25 cy.	16" & 14" Merchant Mill	Direct & Rope	1913	Bethlehem Steel Co.	Steelton, Pa.	GE
105	600-400-200	321-214-107	440	25 cy.	9" Merchant Mill	Direct	1923	Halcomb Steel Co.	Syracuse, N. Y.	GE
106	600	365	6600	25 cy.	10" Merchant Mill	Direct	1913	Minnesota Steel Co.	Duluth, Minn.	W
107	600-400	375-210	2200	25 cy.	9" Merchant Mill	Direct	1912	Forged Steel Wheel Co.	Butler, Pa.	GE
108	600	390	440	60 cy.	20" Merchant Mill	Geared	1916	Stanley Works	New Haven, Conn.	W
109	600-600-600	469-375-281	2200	25 cy.	8" Merchant Mill	Direct	1919	Donner Steel Co.	Buffalo, N. Y.	GE
110	600	485	2200	25 cy.	10" Merchant (Fin.) Mill	Direct	1912	Laclede Steel Co.	Alton, Ill.	W
111	600	485	440	25 cy.	20" Merchant Mill	Geared	1915	Hess Steel Corporation	Baltimore, Md.	W
112	600	500	2200	60 cy.	20" Merchant Mill	Geared	1916	Carpenter Steel Co.	Reading, Pa.	W
113	600	500	2200	60 cy.	16" Merchant Mill	Geared	1917	Central Steel Co.	Massillon, Ohio	W
114	600	500	440	25 cy.	16" Merchant Mill	Geared	1919	Buffalo Bolt Co.	N. Tonawanda, N. Y.	GE
115	600	585-325	550	40 cy.	16" Merchant Mill	Geared	1917	Cohoes Rolling Mill Co.	Cohoes, N. Y.	W
116	600-500-400	600-500-400	2200	25 cy.	Merchant Mill, No. 10	Direct	1916	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
117	650	160	440	60 cy.	14" Guide Mill	Coupled		Withrow Steel Co.	Neville Island, Pa.	AC
118	650	184	6600	25 cy.	18" Merchant Mill	Direct	1909	Indiana Steel Co.	Gary, Ind.	W
119	650	184	6600	25 cy.	14" Merchant Mill	Direct	1909	Indiana Steel Co.	Gary, Ind.	W
120	650	200	440	50 cy.	14" Guide Mill	Coupled		Withrow Steel Co.	Neville Island, Pa.	AC
121	650	210	6600	25 cy.	12" Merchant Mill	Geared	1909	Indiana Steel Co.	Gary, Ind.	W
122	650	233	2200	60 cy.	9" Merchant Mill	Rope	1919	Harrisburg Pipe & Pipe Bending Co.	Harrisburg, Pa.	W
123	650	500	6600	25 cy.	10" Merchant Mill	Direct	1916	Illinois Steel Co.	Gary, Ind.	GE
124	650	500	6600	25 cy.	10" Merchant Mill	Direct	1916	Illinois Steel Co.	Gary, Ind.	GE
125	700	135-360	240	d.c.	Merchant Mill	Direct	1923	Atlas Steel Corporation	Dunkirk, N. Y.	W
126	700	187	2200	25 cy.	14" Merchant Mill	Direct	1920	Donner Steel Co.	Buffalo, NY.	GE
127	700	250-450	250	l.c.	9" Merchant Mill	Direct	1925	Crucible Steel Co.	Pittsburgh, Pa.	GE
128	700	364	2200	25 cy.	8" Merchant Mill	Direct	1912	Laclede Steel Co.	Alton, Ill.	W
129	700-600-400	400-300-200	2200	25 cy.	Merchant Mill, No. 10	Direct	1916	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
130	700-600-400	400-300-200	2200	25 cy.	Merchant Mill, No. 10	Belt	1916	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
131	700	480-240	2200	25 cy.	12" Merchant Mill	Geared	1916	Halcomb Steel Co.	Syracuse, N. Y.	W
132	700	730-490	4000	25 cy.	14" Merchant Mill	Geared	1916	Atlas Steel Corporation	Dunkirk, N. Y.	W
133	700	735	4000	25 cy.	14" Merchant Mill	Geared	1920	Atlas Steel Corporation	Dunkirk, N. Y.	W
134	700	980-530	2200	60 cy.	10" Finishing Mill	Geared	1923	Crucible Steel Co. of America, Park Works	Pittsburgh, Pa.	W
135	750	150-250	600	l.c.	14" Merchant Mill	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
136	750	277	2200	60 cy.	18" Merchant Mill	Geared	1915	Pacific Coast Steel Co.	San Francisco, Cal.	GE
137	800	163	2200	25 cy.	22" Merchant Mill	Rope	1905	Ontario Iron & Steel Co.	Welland, Ont.	W
138	800	189	2200	50	Merchant Mill	Direct	1925	Pacific Coast Steel Co.	San Francisco, Cal.	CW
139	800-800	214-167	6600	25 cy.	16" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
140	800	257	2200	60 cy.	18" Merchant Mill	Geared	1919	Columbia Steel Co.	Pittsburgh, Cal.	GE
141	800	268	2200	50 cy.	14" & 10" Merchant Mill	Rope	1912	United Alloy Steel Corporation	Canton, Ohio	W
142	800	275-550	700	d.c.	12" Merchant Mill	Geared	1925	Penn Seaboard Steel Co.	New Castle, Del.	GE
143	800	275-550	700	l.c.	12" Merchant Mill	Geared	1925	Penn Seaboard Steel Co.	New Castle, Del.	GE
144	800	275-550	700	l.c.	9" Merchant Mill	Direct	1925	Penn Seaboard Steel Co.	New Castle, Del.	GE
145	800	320	440	60 cy.	9" Merchant Mill	Belted	1914	Carnegie Steel Co. Painter Mill	Pittsburgh, Pa.	W
146	800	320	440	60 cy.	10" Merchant Mill	Belted	1914	Carnegie Steel Co. Painter Mill	Pittsburgh, Pa.	W
147	800	350-700	600	d.c.	20" Merchant (Breakd'n)	Geared	1921	Driver Harris Co.	Harrison, N. J.	W
148	800	350-750	600	d.c.	8" Merchant Mill Cont.	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
149	800	353	2200	60 cy.	12"-5 Stand. Merch. Mill	Belt		United Steel Co.	Everett, Wash.	W
150	800	367	2200	25 cy.	8" Merchant Mill	Direct	1917	Donner Steel Co.	BuZalo, N. Y.	W
151	800	375	2200	25 cy.	Merchant Mill	Geared	1920	Bethlehem Steel Co.	Johnstown, Pa.	GE
152	800	400-600	600	d.c.	16" Merchant Mill	Geared	1921	Missouri Rolling Mill Co.	St. Louis, Mo.	W
153	800	410-720	230	d.c.	16" Merchant (Rougher)	Geared	1923	Timken Roller Bearing Co.	Canton, Ohio	W
154	800	440	2200	60 cy.	18" Merchant (Fin.) Mill	Geared	1918	Canton Sheet Steel Co.	Canton, Ohio	W
155	800	705	2200	60 cy.	12" Merchant Mill	Geared	1919	McConway Torley Co.	Pittsburgh, Pa.	W
156	800	730-365	2200	50 cy.	12" Merchant Mill	Geared	1917	Columbia Steel Co.	Los Angeles, Cal.	W
157	800	730-365	2200	50 cy.	22" Merchant Mill	Geared	1917	Columbia Steel Co.	Los Angeles, Cal.	W
158	800	730-485	2200	50 cy.	12" Merchant Mill	Geared	1919	Southern California Iron & Steel Co.	Los Angeles, Cal.	W
159	800	875-700	2200	60 cy.	16" Merchant Mill	Geared	1920	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
160	800	892-623	2200	60 cy.	20" Merchant (Fin.) Mill	Geared	1918	Hoosier Rolling Mill	Terre Haute Ind	W
161	800-800	900-720	2200	60 cy.	9" Merchant Mill	Geared	1923	Knoxville Iron Co.	Knoxville, Tenn.	GE
162	800-800	900-720	2200	60 cy.	9" Merchant Mill	Geared	1923	Knoxville Iron Co.	Knoxville, Tenn.	GE
163	840-700-560	160-300-240	6600	25	9" Merchant Mill	Direct	1925	Bethlehem Steel Co.	Bethlehem, Pa.	GE
164	850-570	214-143	6600	25 cy.	Merchant Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
165	850-850	214-187	6600	25 cy.	10" Merchant Mill	Rope	1916	Illinois Steel Co.	Gary, Ind.	GE
166	850-850	214-187	6600	26 cy.	10" Merchant Mill	Rope	1916	Illinois Steel Co.	Gary, Ind.	GE
167	800	94	2200	25 cy.	18" Merchant Mill	Direct	1912	Forged Steel Wheel Co.	Butler, Pa.	GE
168	800	100	6600	25 cy.	16" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
169	900-900	214-150	2200	25 cy.	12" Merchant Mill	Direct	1910	Algoma Steel Co.	Sault St. Marie, Can.	GE
170	1000	184	2200	25 cy.	16" Merchant Mill	Direct	1908	Bethlehem Steel Co.	Johnstown, Pa.	W
171	1000	200-600	600	d.c.	10" Merchant Mill	Direct	1925	McKinney Steel Co.	Cleveland, Ohio	W
172	1000	250	2200	60 cy.	18" Merchant Mill	Geared	1918	Canton Sheet & Steel Co.	Canton, Ohio	W

MERCHANT MILL DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
173	1000	295	2200	60 cy.	12″ Cont. and 10″ Merchant Mill	Rope & Direct	1920	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
174	1000	300	2200	25 cy.	10″ Merchant Mill	Geared	1916	Halcomb Steel Co.	Syracuse, N. Y.	GE
175	1000	350–150	2200	60 cy.	12″ Merchant Mill	Direct	1918	Central Steel Co.	Massillon, Ohio	W
176	1000	365	2200	50 cy.	Merchant Mill	Geared	1923	Columbia Steel Co.	Torrance, Cal.	W
177	1000	375	4400	25 cy.	Merchant Mill	Geared	1919	Buffalo Bolt Co.	N. Tonawanda, N. Y.	GE
178	1000	518–800	250	d.c.	20″ Merchant Mill	Geared	1919	National Farming Machinery, Ltd.	Montmagny, P. Q.	W
179	1000	590–450	4000	60 cy.	14″ Merchant Mill	Geared	1920	Calumet Steel Co.	Chicago, Ill.	W
180	1000	590–450	4000	60 cy.	14″ Merchant Mill	Geared	1920	Calumet Steel Co.	Chicago, Ill.	W
181	1000	725	2200	25 cy.	12″ Merchant Mill	Geared	1922	Burlington Steel Co., Ltd.	Hamilton, Ont.	W
182	1100	294–205	2200	60 cy.	20″ Merchant Mill	Rope	1912	United Alloy Steel Corporation	Canton, Ohio	W
183	1190–875–525	350–250–150	2200	25	Merchant Mill	Direct-Rope	1925	Bethlehem Steel Co.	Lebanon, Pa.	GE
184	1200–1200	150–250	230	d.c.	12″ Merchant Mill	Direct	1920	Timken Roller Bearing Co.	Canton, Ohio	GE
185	1200	292	2200	25 cy.	12″ Cont. and 10″ Merchant Mill	Direct & Rope	1912	Laclede Steel Co.	Alton, Ill.	W
186	1200–1150–800	300–214–150	2200	25 cy.	Merchant Mill, No. 10	Geared	1916	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
187	1200–1000–800	300–250–200	4400	25 cy.	14″ Merchant Mill	Direct	1919	Buffalo Bolt Co.	N. Tonawanda, N. Y.	GE
188	1200	300–500	600	d.c.	10″ Merchant Mill	Direct	1925	McKinney Steel Co.	Cleveland, Ohio	W
189	1200	368	2200	50 cy.	20″ Merchant Mill	Geared	1919	Southern California Iron & Steel Co.	Los Angeles, Cal.	W
190	1200	485	6400	25 cy.	12″ Merchant Mill	Geared	1916	American Steel & Wire Co.	Cleveland, Ohio	W
191	1200	590–407	2200	60 cy.	20″ Mer. (Rough.) Mill	Geared	1918	Hoosier Rolling Mill Co.	Terre Haute, Ind.	W
192	1250	375	2200	25 cy.	Merchants Bar Mill	Geared		Valley Stee Co.	Milwaukee, Wis.	AC
193	1250	712–430	6600	60 cy.	3 Stand 12″ Mill	Coupled		Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
194	1300– 900	214–140	2200	25 cy.	12″ Merchant Mill	Direct	1912	Forged Steel Wheel Co.	Butler, Pa.	GE
195	1300–1300	214–187	6600	25 cy.	10″ Merchant Mill	Geared	1916	Illinois Steel Co.	Gary, Ind.	GE
196	1400– 945	600–405	2200	60 cy.	21″ Merchant Mill	Geared	1915	Union Rolling Mills Co.	Cleveland, Ohio	GE
197	1500	50–80	600	d.c.	8″ Merchant Cont. Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
198	1500	80	2200	60 cy.	Morgan Cont. Mill	Coupled		Interstate Iron & Steel Co.	Chicago, Ill.	AC
199	1500	94	2200	25 cy.	18″ Merchant Mill	Direct	1910	Algoma Steel Co.	S'lt. St. Marie, Can.	GE
200	1500	100–150	600	d.c.	14″ Merchant Mill	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
201	1500	200–300	600	d.c.	10″ Merchant Mill	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
202	1500	218–145	6600	25 cy.	18″ Merchant Mill	Geared	1916	Carnegie Steel Co.	Duquesne, Pa.	W
203	1500–1250–875	300–250–175	2200	50	Merchant Mill	Direct	1925	Southern Calif. Iron & Steel Co.	Los Angeles, Cal.	GE
204	1500–1200–900	320–275–200	2200	60	10″ Merchant Mill	Geared	1925	Pacific Coast Steel Co.	San Francisco, Cal.	GE
205	1500	360–240	6600	25 cy.	12″ Merchant Mill	Rope	1916	Carnegie Steel Co.	Duquesne, Pa.	W
206	1500–1125	375–281	2200	25 cy.	10″ Merchant Mill	Geared	1916	Donner Steel Co.	Buffalo, N. Y.	GE
207	1500	593	6600	60 cy.	6 Stand 11″ Mill	Coupled		Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
208	1500	890–540	6600	60 cy.	4 Stand 12″ Mill	Coupled		Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
209	1800	200–400	600	d.c.	8″ Merchant Cont. Mill	Geared	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
210	1800–1800	250–125	6600	25 cy.	22″ Merchant Mill	Geared	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
211	1800	550–650	250	d.c.	22″ Merchant Mill	Geared	1925	Crucible Steel Co.	Pittsburgh, Pa.	GE
212	2000	94	2200	25 cy.	18″ Merchant Mill	Direct	1912	Forged Steel Wheel Co.	Butler, Pa.	GE
213	2000	113	6600	25 cy.	12″ Merchant Mill	Direct	1909	Indiana Steel Co.	Gary, Ind.	W
214	2000	134–275	600	d.c.	10″ Merchant Mill	Direct	1925	McKinney Steel Co.	Cleveland, Ohio	W
215	2000	163–113	6600	25 cy.	10″ Merchant Mill	Direct	1909	Indiana Steel Co.	Gary, Ind.	W
216	2000	230–460	600	d.c.	Merchant Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
217	2000	230–460	600	d.c.	Merchant Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
218	2000	230–460	600	d.c.	Merchant Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
219	2000	250–150	2200	60 cy.	Morgan Cont. Mill	Coupled		Interstate Iron & Steel Co.	Chicago, Ill.	AC
220	2500	113–91	6600	25 cy.	12″ Merchant Mill	Direct	1909	Indiana Steel Co.	Gary, Ind.	W
221	2500–2080–1670	240–200–160	6300	50 cy.	12″ Merchant Mill	Geared	1920	United Steel Co., Ltd.	Sheffield, Eng.	GE
222	3000	209	6600	25 cy.	12″ and 16″ Merchant Mill	Rope & Geared	1913	Minnesota Steel Co.	Duluth, Minn.	W
223	3000	375	2200	25 cy.	14″ Merchant Mill	Geared	1916	Donner Steel Co.	Buffalo, N. Y.	GE
224	3000	505–300	2200	60 cy.	12″ Merchant Mill	Geared	1920	United Alloy Steel Corporation	Canton, Ohio	W
225	3200	91	6600	25 cy.	18″ Merchant Mill	Geared	1909	Indiana Steel Co.	Gary, Ind.	W
226	3200	91	6600	25 cy.	14″ Merchant Mill	Geared	1909	Indiana Steel Co.	Gary, Ind.	W
227	4000	147	6600	25 cy.	20″ Merchant Mill	Geared	1916	Illinois Steel Co.	Gary, Ind.	W
228	4500–4500	67.5–110	500	d.c.	14″ Merchant Mill	Geared	1923	Ford Motor Co.	Detroit, Mich.	GE
229	4500–4500	500–300	2200	25 cy.	14″ Merchant Mill	Geared	1923	Inland Steel Co.	Indiana Harbor, Ind.	GE

WIRE MILLS

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300	375	2200	25 cy.	Wire Mill	Geared	1910	Bethlehem Steel Co.	Johnstown, Pa.	GE
2	300	375	2200	25 cy.	Wire Mill	Geared	1910	Bethlehem Steel Co.	Johnstown, Pa.	GE
3	300	375	2200	25 cy.	Wire Mill	Geared	1910	Bethlehem Steel Co.	Johnstown, Pa.	GE
4	300	375	2200	25 cy.	Wire Mill	Geared	1910	Bethlehem Steel Co.	Johnstown, Pa.	GE
5	300	375	2200	25 cy.	Wire Mill	Belt	1915	American Steel & Wire Co.	Cleveland, Ohio	GE
6	300	375	2200	25 cy.	Wire Mill	Belt	1915	American Steel & Wire Co.	Cleveland, Ohio	GE
7	300	375	2200	25 cy.	Wire Mill	Belt	1915	American Steel & Wire Co.	Cleveland, Ohio	GE
8	300	375	2200	25 cy.	Wire Mill	Belt	1915	American Steel & Wire Co.	Cleveland, Ohio	GE
9	300	375	2200	25 cy.	Wire Mill	Belt	1915	American Steel & Wire Co.	Cleveland, Ohio	GE
10	300	450	440	60 cy.	Wire Mill			American Steel & Wire Co.	Joliet, Ill.	AC
11	300	450	440	60 cy.	Wire Mill	Geared		American Steel & Wire Co.	Joliet, Ill.	AC
12	300	600	2300	60 cy.	Wire Mill	Geared	1917	American Steel & Wire Co.	Waukegan, Ill.	GE
13	325	600	2300	60 cy.	Wire Mill	Geared	1917	American Steel & Wire Co.	Waukegan, Ill.	GE
14	350	300	230	d.c.	Wire Draw Bench	Coupled	1908	Pittsburgh Steel Co.	Monessen, Pa.	CW
15	350	300	230	d.c.	Wire Draw Bench	Coupled	1908	Pittsburgh Steel Co.	Monessen, Pa.	CW
16	350	300	230	d.c.	Wire Draw Bench	Coupled	1908	Pittsburgh Steel Co.	Monessen, Pa.	CW
17	350	300	230	d.c.	Wire Draw Bench	Coupled	1911	Pittsburgh Steel Co.	Monessen, Pa.	CW
18	400	600	2200	60 cy.	Wire Rod Mill	Geared		Rome Wire Co.	Rome, N. Y.	AC
19	400	600	440	60 cy.	Wire Rod Mill	Coupled		Rome Wire Co.	Rome, N. Y.	AC
20	500	450	440	60 cy.	Wire Mill	Geared	1916	Waclark Wire Co.	Elizabeth, N. J.	GE
21	750	514	2200	60 cy.	Wire Rod Mill	Geared		Kokomo Steel & Wire Co.	Kokomo, Ind.	AC
22	900	163	2200	60 cy.	Wire Rod Mill	Coupled		Kokomo Steel & Wire Co.	Kokomo, Ind.	AC
23	1200	514	2200	60 cy.	Wire Rod Mill	Geared		Kokomo Steel & Wire Co.	Kokomo, Ind.	AC
24	1300	360	2200	60 cy.	Wire Rod Mill	Coupled		Kokomo Steel & Wire Co.	Kokomo, Ind.	AC
25	1500	514	2200	60 cy.	Wire Rod Mill	Coupled		Kokomo Steel & Wire Co.	Kokomo, Ind.	AC

WHEEL MILLS

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300	450–750	230	d.c.	Wheel Mill	Geared		Bethlehem Steel Co.	Johnstown, Pa.	AC
2	300	450–750	230	d.c.	Wheel Mill	Geared		Bethlehem Steel Co.	Johnstown, Pa.	AC
3	500	155–500	250	d.c.	Tyre Mill	Direct	1923	McConway Torley Co.	Pittsburgh, Pa.	W
4	500	214	6600	25 cy.	Axle Mill	Geared	1909	Illinois Steel Co.	Gary, Ind.	GE
5	500	375	2200	25 cy.	Wheel Mill	Geared		Bethlehem Steel Co.	Johnstown, Pa.	AC
6	750	130	550	d.c.	Wheel Mill	Direct	1915	Carnegie Steel Co.	McKees Rocks, Pa.	GE
7	750	160	550	d.c.	Wheel Mill	Direct	1916	Edgewater Steel Co.	Oakmont, Pa.	GE
8	750	160	550	d.c.	Wheel Mill	Direct	1916	Edgewater Steel Co.	Oakmont, Pa.	GE
9	750	160	550	d.c.	Wheel Mill	Direct	1919	Edgewater Steel Co.	Oakmont, Pa.	GE
10	900–720	200–160	220	d.c.	Wheel Mill	Geared	1906	Bethlehem Steel Co.	Johnstown, Pa.	GE
11	1000	137	6600	25 cy.	Wheel Mill	Geared		Illinois Steel Co.	Gary, Ind.	AC
12	1000	375	2200	25 cy.	Wheel Mill	Geared		Bethlehem Steel Co.	Johnstown, Pa.	AC
13	2000	375	2200	25 cy.	Wheel Mill	Geared		Bethlehem Steel Co.	Johnstown, Pa.	AC

ALUMINUM, BRASS, COPPER AND NON-FERROUS MILL DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300	290	2200	25 cy.	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
2	300	290	2200	25 cy.	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
3	300	290	2200	25 cy.	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
4	300	290	2200	25 cy.	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
5	300	300–600	230	d.c.	20″ x 30″ Brass Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
6	300	300–600	230	d.c.	20″ x 30″ Brass Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
7	300	300–600	230	d.c.	22″ x 36″ Brass Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
8	300	300–600	230	d.c.	22″ x 36″ Brass Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
9	300	300	2200	60 cy.	26″ Cold Mill	Coupled		International Nickel Co.	Huntington, W. Va.	AC
10	300	435	2200	60 cy.	24″ x 48″ Copper Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
11	300	435	2200	60 cy.	18″ Copper Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
12	300	500		60	Brass Mill	Coupled	1917	British American Metals Co.	Plainfield, N. J.	CW
13	300	514	440	60 cy.	Brass Mill	Geared	1915	Chase Metal Works	Waterbury, Conn.	GE
14	300	514	550	60 cy.	Brass Sheet Mill	Geared	1919	National Conduit & Cable Co.	Hastings, N. Y.	GE
15	300	585	440	60 cy.	18″ Copper (Rough.) Mill	Chain	1916	Standard Underground Cable Co.	Perth Amboy, N. J.	W
16	300	600	2200	60 cy.	Brass Mill	Geared	1915	Chase Metal Works	Waterbury, Conn.	GE
17	300	600	440	60 cy.	Brass Mill	Geared	1919	Bristol Brass Co.	Bristol, Conn.	GE
18	300	600	440	60 cy.	Brass Mill			Detroit Copper & Brass Co.	Detroit, Mich.	AC
19	300	600	440	60	Copper Strip Mill	Geared	1925	Detroit Copper & Brass Co.	Detroit, Mich.	CW
20	350	250	440	25 cy.	Brass Mill	Geared	1921	Harrison Radiator Corp.	Lockport, N. Y.	GE
21	350–350	275–470	375	d.c.	Reversing Copper Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	GE
22	350–350	275–470	375	d.c.	Reversing Copper Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	GE
23	350–350	275–470	375	d.c.	Reversing Copper Mill	Geared	1920	American Brass Co.	Kenosha, Wis.	GE
24	350–350	275–470	375	d.c.	Reversing Copper Mill	Geared	1922	Taunton-New Bedf'd Copper Co.	Taunton, Mass.	GE
25	350	400	2200	60 cy.	Wire Rod Mill	Geared		Taunton New Bedf'd Copper Co.	New Bedford, Mass.	AC
26	350	400	2200	60 cy.	Wire Rod Mill	Coupled		Taunton New Bedf'd Copper Co.	New Bedford, Mass.	AC
27	350	400	2200	60 cy.	Wire Rod Mill	Coupled		Taunton New Bedf'd Copper Co.	New Bedford, Mass.	AC
28	350	490	2200	25 cy.	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
29	350	490	2200	25 cy.	Brass Mill	Geared	1920	American Brass Co.	Buffalo, N. Y.	W
30	400	350	440	60 cy.	9″ Copper (Fin.) Mill	Direct	1916	Standard Underground Cable Co.	Perth Amboy, N. J.	W
31	400	352	2200	60 cy.	Copper Rod Mill	Geared	1923	American Brass Company	Kenosha, Wis.	W
32	400	360	2200	60 cy.	Brass Mill	Geared	1917	American Brass Co.	Waterbury, Conn.	GE
33	400	360	2200	60 cy.	Brass Mill	Geared	1917	American Brass Co.	Waterbury, Conn.	GE
34	400	360	2200	60 cy.	Brass Mill	Geared	1921	American Brass Co.	Torrington, Conn.	GE
35	400	360	2200	60 cy.	Brass Mill	Geared	1921	American Brass Co.	Torrington, Conn.	GE
36	400	435	2200	60 cy.	Aluminum Mill	Geared	1918	U. S. Aluminum Co.	New Kensington, Pa.	W
37	400	435	2200	60 cy.	Aluminum Mill	Geared	1918	U. S. Aluminum Co.	New Kensington, Pa.	W
38	400	435	2200	60 cy.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Edgewater, N. J.	W
39	400	440	2200	60 cy.	Copper Rod Mill	Geared	1923	American Brass Company	Kenosha, Wis.	W
40	400	450	2200	60 cy.	Brass Mill	Geared	1917	American Brass Company	Waterbury, Conn.	GE
41	400	450	440	60 cy.	Brass Sheet Mill	Geared	1920	Detroit Copper & Brass Co.	Detroit, Mich.	GE
42	400	450	440	60 cy.	Sheet Mill	Geared	1924	New Jersey Zinc Co.	Palmerton, Pa.	GE
43	400	450	440	60 cy.	Sheet Mill	Geared	1924	New Jersey Zinc Co.	Palmerton, Pa.	GE
44	400	514	2200	60 cy.	Brass Tubes	Geared	1915	American Brass Co.	Waterbury, Conn.	GE
45	400	514	2200	60 cy.	Brass Tubes	Geared	1915	American Brass Co.	Waterbury, Conn.	GE
46	400	514	440	60 cy.	16″ Copper Bar Mill	Geared	1916	Waclark Wire Co.	Elizabeth, N. J.	GE
47	400	514	2200	60 cy.	Brass Mill	Geared	1922	Western Cartridge Co.	East Alton, Ill.	GE
48	400	514	2200	60 cy.	20″ Flat Mill	Geared		American Brass Company	Kenosha, Wis.	AC
49	400	514	2200	60 cy.	24″ Roughing Mill	Geared		American Brass Company	Kenosha, Wis.	AC
50	400	514	2200	60 cy.	18″ Bar Mill	Geared		American Brass Company	Kenosha, Wis.	AC
51	400	575	440	60 cy.	Sheet Copper Rolling Mill	Geared	1923	American Metal Products Co.	Milwaukee, Wis.	W
52	400	600	440	60 cy.	Brass Mill	Geared	1917	Rome Brass & Copper Co.	Rome, N. Y.	GE
53	400	600	2200	60 cy.	Brass Mill	Geared	1921	American Brass Co.	Torrington, Conn.	GE
54	400	600	2200	60 cy.	Zinc Mill	Geared	1922	Ball Bros. Glass Co.	Muncie, Ind.	GE
55	400	600	2200	60	Brass Rolling Mill	Geared	1925	American Brass Co.	Torrington, Conn.	GE
56	400	720	2200	60 cy.	Copper Mill	Geared	1920	Rome Wire Co.	Rome, N. Y.	GE
57	400	720	550	60 cy.	Copper Mill	Geared	1920	Phillips Wire Co.	Pawtucket, R. I.	GE
58	400–200	800–400	230	d.c.	Copper Sheet Mill	Geared	1925	Rome Brass & Copper Co.	Rome, N. Y.	GE
59	400	900	550	60 cy.	Brass Mill	Geared	1920	American Brass Company	Ansonia, Conn.	GE
60	400	900	550	60 cy.	Brass Mill	Geared	1920	American Brass Company	Ansonia, Conn.	GE
61	400	900	550	60 cy.	Brass Mill	Geared	1920	American Brass Company	Ansonia, Conn.	GE
62	400	900	550	60 cy.	Brass Mill	Geared	1920	American Brass Company	Ansonia, Conn.	GE
63	400	900	550	60 cy.	Brass Mill	Geared	1921	American Brass Company	Ansonia, Conn.	GE
64	450	200–400	230	d.c.	Zinc Sheet Mill 26″ x 72″	Geared	1924	Illinois Zinc Co.	Peru, Illinois	W
65	450	500	440	60 cy.	Brass Mill	Geared	1918	Michigan Copper & Brass Co.	Detroit, Mich.	W
66	450	550–750	230	d.c.	Zinc Rolls	Coupled	1924	Mattheisen Hegeler Zinc Co.	LaSalle, Ill.	CW
67	450	550–750	230	d.c.	Zinc Strip Mills	Geared	1925	Mattheisen & Hegeler Zinc Co.	LaSalle, Ill.	CW
68	450	600	550	60 cy.	Copper Rod Mill	Geared	1920	Phillips Wire Co.	Pawtucket, R. I.	GE
69	450	870	440	60 cy.	Copper Clad Mill	Geared	1915	Duplex Metal Co.	Philadelphia, Pa.	W
70	500	0–200	500	d.c.	78″ Rev. Brass Plate Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
71	500	220–400	550	d.c.	Brass Mill	Geared	1913	Scoville Manufacturing Co.	Waterbury, Conn.	W
72	500	220–400	550	d.c.	Brass Mill	Geared	1913	Scoville Manufacturing Co.	Waterbury, Conn.	W
73	500	220–400	550	d.c.	Brass Mill	Geared	1913	Scoville Manufacturing Co.	Waterbury, Conn.	W
74	500	220–400	550	d.c.	Brass Mill	Geared	1913	Scoville Manufacturing Co.	Waterbury, Conn.	W
75	500	220–400	500	d.c.	Brass Mill	Geared	1913	Scoville Manufacturing Co.	Waterbury, Conn.	W
76	500	290	2200	25 cy.	Brass Mill	Geared	1920	American Brass Company	Buffalo, N. Y.	W
77	500	360	2200	60 cy.	Tube Mill	Geared	1915	American Brass Company	Waterbury, Conn.	GE
78	500	360	2200	60 cy.	Copper Mill	Geared	1917	Anaconda Copper Mining Co.	Black Eagle, Mont.	GE
79	500	360	440	60 cy.	Brass Mill	Direct	1923	Rome Brass & Copper Co.	Rome, N. Y.	GE
80	500	360	440	60 cy.	Brass Mill	Direct	1923	Rome Brass & Copper Co.	Rome, N. Y.	GE
81	500	360–612	600	d.c.	Reversing Hot Mill	Geared	1925	Michigan Copper & Brass Co.	Detroit, Mich.	GE
82	500	365	440	25 cy.	Copper Rolling Mill	Rope	1922	Baltimore Cop. Smelt. & Roll. Co.	Baltimore, Md.	W

ALUMINUM, BRASS, COPPER AND NON-FERROUS MILL DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
83	500	368	2200	25 cy.	Brass Mill	Geared	1920	American Brass Company	Buffalo, N. Y.	W
84	500	375	2300	25		Geared	1925	Buffalo Copper & Brass Co.	Buffalo, N. Y.	AC
85	500	440	2200	60 cy.	Copper Rod Mill	Geared	1923	American Brass Company	Kenosha, Wis.	W
86	500	450	2200	60 cy.	Brass Mill	Geared	1915	Scoville Manufacturing Co.	Waterbury, Conn.	GE
87	500	450	2200	60 cy.	Brass Mill	Geared	1915	Scoville Manufacturing Co.	Waterbury, Conn.	GE
88	500	450	2200	60 cy.	Brass Mill	Geared	1915	Scoville Manufacturing Co.	Waterbury, Conn.	GE
89	500	450	2200	60 cy.	Brass Mill	Geared	1915	Chase Metal Works	Waterbury, Conn.	GE
90	500	450	440	60 cy.	20" Copper Mill	Geared	1916	Waclark Wire Co.	Elizabeth, N. J.	GE
91	500	450	2200	60 cy.	Copper Mill	Geared	1917	Anaconda Copper Mining Co.	Black Eagle, Mont.	GE
92	500	450	2200	60 cy.	Copper Mill	Geared	1917	Anaconda Copper Mining Co.	Black Eagle, Mont.	GE
93	500	450	2200	60 cy.	Brass Mill	Geared	1917	American Brass Company	Waterbury, Conn.	GE
94	500	450	2200	60 cy.	Brass Mill	Geared	1917	American Brass Company	Waterbury, Conn.	GE
95	500	450	440	60 cy.	Brass Sheet Mill	Geared	1920	Detroit Copper & Brass Co.	Detroit, Mich.	GE
96	500	450	2200	60 cy.	Brass Mill	Geared	1921	American Brass Company	Torrington, Conn.	GE
97	300	450	2200	60 cy.	Brass Mill	Geared	1921	American Brass Company	Torrington, Conn.	GE
98	500	450	2200	60 cy.	14" Roughing Mill	Geared		International Nickel Co.	Huntington, W. Va.	AC
99	500	450	2200	60 cy.	9" Finishing Mill	Geared		International Nickel Co.	Huntington, W. Va.	AC
100	500	450	440	60	20" Copper Mill	Coupled	1918	Waclark Wire Company	Bayway, N. J.	CW
101	500	514	550	60 cy.	18" Copper Mill	Geared	1919	National Conduit and Cable Co.	Hastings, N. Y.	GE
102	500	514	2200	60 cy.	Brass Mill	Geared	1922	Western Cartridge Co.	East Alton, Ill.	GE
103	500	575	2200	60 cy.	Copper Rod Mill	Geared	1923	American Brass Company	Kenosha, Wis.	W
104	500	600	2200	60 cy.	Brass Mill	Geared	1917	American Brass Company	Waterbury, Conn.	GE
105	500	600	2200	60 cy.	Brass Mill	Geared	1917	American Brass Company	Waterbury, Conn.	GE
106	500	600	2200	60 cy.	Brass Mill	Geared	1917	American Brass Company	Torrington, Conn.	GE
107	500	600	2200	60 cy.	Copper Rod Mill	Geared	1922	E. F. Phillips Electrical Works, Ltd.	Montreal, Que.	W
108	500	600	2200	60 cy.	Copper Rolling Mill	Geared	1923	American Brass Company	Torrington, Conn.	GE
109	600	300	440	25 cy.	Tandem Plate Mill	Rope		Baltimore Copper S. & R. Co.	Baltimore, Md.	AC
110	600	300	440	25 cy.	Tandem Plate Mill	Rope		Baltimore Copper S. & R. Co.	Baltimore, Md.	AC
111	600	360–400	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
112	600	360–440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
113	600	360–440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
114	600	360	440	60 cy.	Copper Mills	Geared	1923	Am. Insulated Wire & Cable Co.	Chicago, Ill.	GE
115	600	450	2200	60 cy.	Aluminum Strip Mill	Geared	1914	Cleveland Metal Products Co.	Cleveland, Ohio	GE
116	600	500	575	25 cy.	Brass Sheet Mill	Geared	1920	Baltimore Tube Co.	Baltimore, Md.	GE
117	600	500	575	25 cy.	Brass Sheet Mill	Geared	1920	Baltimore Tube Co.	Baltimore, Md.	GE
118	600	514	2200	60 cy.	Brass Mill	Geared	1922	Western Cartridge Co.	East Alton, Ill.	GE
119	600	600	4000	60 cy.	Brass Mill	Geared	1919	Bristol Brass Co.	Bristol, Conn.	GE
120	600	600	2200	60 cy.	Copper Mill	Geared	1920	American Brass Co.	Waterbury, Conn.	GE
121	600	600	2200	60 cy.	Brass Mill	Geared	1921	American Brass Company	Waterbury, Conn.	GE
122	600	600	550	60	Copper Rod Mill	Geared	1925	Phillips Wire Co.	Pawtucket, R. I.	GE
123	600	900	440	60 cy.	Copper Rod Mill	Geared	1920	Western Electric Co.	Hawthorne, Ill.	GE
124	600	900	550	60 cy.	Brass Mill	Geared	1920	American Brass Company	Ansonia, Conn.	GE
125	600	900	440	60 cy.	Copper Mill	Geared	1923	Am. Insulated Wire & Cable Co.	Chicago, Ill.	GE
126	700	360	440	60 cy.	Brass Mill	Chain		Detroit Copper & Brass Co.	Detroit, Mich.	AC
127	700	585	2200	60 cy.	Copper Rod Mill	Geared	1923	Eugene F. Phillips Elec. Works, Ltd.	Montreal, Que.	W
128	700	735	440	25 cy.	Copper Rolling Mill	Geared	1924	Baltimore Cop. Smelt. & Roll. Co.	Baltimore, Md.	W
129	700	735	440	25 cy.	Copper Rolling Mill	Geared	1924	Baltimore Cop. Smelt. & Roll. Co.	Baltimore, Md.	W
130	700	735	440	25 cy.	Copper Rolling Mill	Geared	1924	Baltimore Cop. Smelt. & Roll. Co.	Baltimore, Md.	W
131	750	353	4600	60 cy.	Brass Mill	Geared	1924	Scoville Manufacturing Co.	Waterbury, Conn.	W
132	750	514	550	60 cy.	10" and 9" Copper Mills	Geared	1919	National Conduit & Cable Co.	Hastings, N. Y.	GE
133	750	514	550	60 cy.	10" and 9" Copper Mills	Geared	1919	National Conduit & Cable Co.	Hastings, N. Y.	GE
134	750	600	4000	60 cy.	Brass Mill	Geared	1919	Bristol Brass Co.	Bristol, Conn.	GE
135	750	720	2200	60 cy.	Zinc Rolling Mill	Geared	1923	American Zinc Products Co.	Greencastle, Ind.	GE
136	750	720	550	60	Brass Rolling Mill	Geared	1925	American Brass Co.	Ansonia, Conn.	GE
137	800	350	2200	60 cy.	Aluminum Mill	Geared	1915	U. S. Aluminum Co.	Edgewater, N. J.	W
138	800	353	440	50 cy.	8" Copper Rod Mill	Direct	1923	Standard Underground Cable Co.	St. Louis, Mo.	W
139	800	360–440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
140	800	360–440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
141	800	370	650	d.c.	Aluminum Mill	Direct	1917	U. S. Aluminum Co.	Niagara Falls, N. Y.	W
142	800	370–400	650	d.c.	Aluminum Mill	Direct	1919	U. S. Aluminum Co.	Niagara Falls, N. Y.	W
143	800	443	2200	60 cy.	Roughing Mill	Coupled		International Nickel Co.	Huntington, W. Va.	AC
144	800	450	2200	60 cy.	14" Merchant Mill	Geared		International Nickel Co.	Huntington, W. Va.	AC
145	800	720	4600	60	Rolling Mill	Geared	1925	Michigan Copper & Brass Co.	Detroit, Mich.	AC
146	800	720	4600	60	Rolling Mill	Geared	1925	Michigan Copper & Brass Co.	Detroit, Mich.	AC
147	800	720	4600	60	Rolling Mill	Geared	1925	Michigan Copper & Brass Co.	Detroit, Mich.	AC
148	800	720	4600	60	Rolling Mill	Geared	1925	Michigan Copper & Brass Co.	Detroit, Mich.	AC
149	800	720	4600	60	Rolling Mill	Geared	1925	Michigan Copper & Brass Co.	Detroit, Mich.	AC
150	800	870	2200	60 cy.	Copper Rod Mill	Geared	1923	American Brass Company	Kenosha, Wis.	W
151	800	870	3200	60 cy.	Copper Rod Mill	Geared	1923	American Brass Company	Kenosha, Wis.	W
152	800	900	440	60 cy.	Copper Rod Mill	Geared	1920	Western Electric Co.	Hawthorne, Ill.	GE
153	900	900	440	60 cy.	Copper Rod Mill	Geared	1920	Western Electric Co.	Hawthorne, Ill.	GE
154	1000	300	2200	25 cy.	Aluminum Rod Mill	Geared	1922	U. S. Aluminum Co.	Massena, N. Y.	GE
155	1000	450	2200	60 cy.	20" Merchant Mill	Geared		International Nickel Co.	Huntington, W. Va.	AC
156	1000	600	2300	60	Copper Mill	Geared	1925	American Copper Products Co.	Elizabeth, N. J.	GE
157	1200	360	2200	60 cy.	24" Bar Mill	Geared		International Nickel Co.	Huntington, W. Va.	AC
158	1200	360	2200	60 cy.	30" Sheet Mill	Geared		International Nickel Co.	Huntington, W. Va.	AC
159	1200	400	650	d.c.	Aluminum Plate Mill	Geared	1915	Aluminum Company of America	Niagara Falls, N. Y.	GE
160	1350	600	2300	60 cy.	Copper Mill	Geared	1918	American Brass Company	Waterbury, Conn.	GE

REVERSING MILL DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	350	275–470	375	d.c.	Reversing Copper Mill	Geared	1920	American Brass Company	Buffalo, N. Y.	GE
2	350	275–470	375	d.c.	Reversing Copper Mill	Geared	1920	American Brass Company	Buffalo, N. Y.	GE
3	350	275–470	375	d.c.	Reversing Copper Mill	Geared	1920	American Brass Company	Kenosha, Wis.	GE
4	350	275–470	375	d.c.	Reversing Copper Mill	Geared	1922	Taunton-New Bedford Copper Co.	Taunton, Mass.	GE
5	400	20	230	d.c.	32 x 48 Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Ind.	CW
6	400	20	230	d.c.	32 x 48 Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Ind.	CW
7	400	20	230	d.c.	32 x 48 Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Ind.	CW
8	400	20	230	d.c.	32 x 48 Plate Mill	Coupled	1910	American Sheet & Tin Plate Co.	Gary, Ind.	CW
9	500	–200	500	d.c.	78" Rev. Brass Plate Mill	Geared	1920	West Virginia Metal Products Co.	Fairmont, W. Va.	W
10	500	360–612	600	d.c.	Reversing Hot Mill	Geared	1925	Michigan Copper & Brass Co.	Detroit, Mich.	GE
11	700	86	450	d.c.	Shear Intensifier	Direct	1918	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
12	800	37–70	500	d.c.	Plate Mill	Coupled		Universal Rolling Mill Co.	Bridgeville, Pa.	AC
13	1000	50–100	600	d.c.	24" Billet (Roughing)	Direct	1916	American Steel & Wire Co.	Cleveland, Ohio	W
14	1000	50–175	600	d.c.	24" Mill	Direct	1916	Central Steel Co.	Massillon, Ohio	W
15	1750	70–120	600	d.c.	20" Billet Mill	Direct	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
16	1800	–40	600	d.c.	84" Rev. Shrd. Plate Mill	Direct	1919	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
17	2000	50–100	600	d.c.	30" Bar Mill	Direct	1919	Follansbee Brothers Co.	Toronto, O.	W

REVERSING MILL DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
18	2100	50-125	700	d.c.	42" Universal Plate Mill	Direct	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
19	2100	47-120	700	d.c.	34" Blooming Mill	Direct	1916	Penn Seaboard Steel Corporation	New Castle, Del.	W
20	2200	50-120	600	d.c.	40" Universal Plate Mill	Direct	1919	Dominion Foundrys & Steel Co.	Hamilton, Ont.	W
21	2200	70-150	600	d.c.	28" Blooming Mill	Direct	1920	Atlantic Steel Co.	Atlanta, Ga.	W
22	2900	47-120	700	d.c.	34" Blooming Mill	Direct	1917	Sharon Steel Hoop Co.	Youngstown, Ohio	W
23	3000	70-150	750		24" Reversing Bar Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
24	3100	70-150	600	d.c.	Universal Plate Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
25	3200	50-120	700	d.c.	34" Struct. (Rough.) Mill	Direct	1915	Inland Steel Co.	Indiana Harbor, Ind.	W
26	3200	50-120	700	d.c.	28" Struct. (Fin.) Mill	Direct	1915	Inland Steel Co.	Indiana Harbor, Ind.	W
27	3250	50-120	500	d.c.	36" Blooming Mill	Direct	1916	Am. Rolling Mill Co.	Ashland, Ky.	GE
28	3250	50-120	500	d.c.	34" Blooming Mill	Direct	1916	Keystone Steel & Wire Co.	Peoria, Ill.	GE
29	3500	70-100	525	d.c.	32" Blooming Mill	Direct	1913	Steel Company of Canada	Hamilton, Ont.	W
30	3500	50- 75	700	d.c.	34" Blooming Mill	Direct	1914	Central Steel Co.	Massillon, Ohio	W
31	3500	50-120	700	d.c.	35" Roughing Struct. Mill	Direct	1924	Bethlehem Steel Corp.	Lackawanna, N. Y.	W
32	3500	50-120	700	d.c.	34" Blooming Mill	Direct	1925	Kokomo Steel & Wire Co.	Kokomo, Ind.	W
33	3500	50-120	700	d.c.	36" Blooming Mill	Direct	1925	Phoenix Iron Co.	Phoenixville, Pa.	W
34	3600	40- 90	600	d.c.	35" Blooming Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	W
35	3600	40- 90	600	d.c.	40" Blooming Mill	Direct	1917	Illinois Steel Co.	Gary, Ind.	W
36	4000	0-150	575	d.c.	36" Univ. Plate Mill	Direct	1905	Illinois Steel Co.	South Chicago, Ill.	W
37	4000	50-120	700	d.c.	34" Blooming Mill	Direct	1924	Donner Steel Co.	Buffalo, N. Y.	GE
38	4000	80-135	650	d.c.	30" Univ. Skelp Mill	Direct	1922	Youngstown Sheet & Tube Co.	Youngstown, Ohio	GE
39	4000	0- 80	1200	d.c.	34" Blooming Mill	Coupled		Algoma Steel Co.	Sault Ste. Marie,Can.	AC
40	5000	40-120	600	d.c.	40" Blooming Mill	Direct	1916	National Tube Co.	Lorain, Ohio	W
41	5000	40-120	600	d.c.	35" Blooming Mill	Direct	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
42	5000	40-120	600	d.c.	35" Blooming Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
43	5000	50-120	700	d.c.	36" Rev. Roughing Struct.	Direct	1924	Carnegie Steel Co.	Homestead, Pa.	W
44	5000	75-100	700	d.c.	48" Universal Plate Mill	Direct	1923	Bethlehem Steel Co.	Lackawanna, N. Y.	W
45	5000	75-150	700	d.c.	28" Fin. Structural Mill	Direct	1924	Bethlehem Steel Corp.	Lackawanna, N. Y.	W
46	6000	40-120	600	d.c.	44" Blooming Mill	Direct	1919	Bethlehem Steel Co.	Steelton, Pa.	W
47	6500	40-120	600	d.c.	40" Blooming Mill	Direct	1915	Inland Steel Co.	Indiana Harbor, Ind.	W
48	6500	50-120	600	d.c.	36" Blooming Mill	Direct	1916	Trumbull Steel Co.	Warren, Ohio	GE
49	6500	50-120	600	d.c.	40" Blooming Mill	Direct	1916	Bethlehem Steel Co.	Sparrows Point, Md.	GE
50	6500	50-120	600	d.c.	40" Blooming Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
51	7000	50-120	700	d.c.	40" Rev. Blooming Mill	Direct	1923	Bethlehem Steel Co.	Lackawanna, N. Y.	W
52	7000	50-120	700	d.c.	44" Blooming Mill	Direct	1924	Carnegie Steel Co.	Homestead, Pa.	W
53	7000	50-120	700	d.c.	40" Blooming Mill	Direct	1924	International Harvester Co. Wisconsin Steel Works	Chicago, Ill.	W
54	7000	50-150	700	d.c.	52" Structural Mill	Direct	1925	Carnegie Steel Co.	Homestead, Pa.	W
55	7000	50-150	700	d.c.	52" Structural Mill	Direct	1925	Carnegie Steel Co.	Homestead, Pa.	W
56	7000	50-120	700	d.c.	36" Rev. Rougher Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	W
57	7000	50-100	650		46" Slabbing Mill	Direct	1925	Bethlehem Steel Co.	Sparrows Point, Md.	GE
58	7000	40-120	700	d.c.	Blooming Mill	Coupled	1925	Illinois Steel Co.	So. Chicago, Ill.	AC
59	7000	55-120	900	d.c.	45" Blooming Mill	Direct	1917	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
60	7000	50-100	700	d.c.	60" Universal Plate Mill	Direct	1919	Bethlehem Steel Co.	Sparrows Point, Md.	W
61	8000	40-120	700	d.c.	54" Blooming Mill	Direct	1925	Carnegie Steel Co.	Homestead, Pa.	W
62	8000	150	600	d.c.	28" Rail Mill	Direct	1917	Bethlehem Steel Co.	Lackawanna, N. Y.	GE

A. C. SPEED SETS

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300-300	187.5-112.5	2200	25 cy.	12" Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
2	300-300	187.5-112.5	2200	25 cy.	12" Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
3	300-300	300-180	2200		10" Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
4	300-225-165	335-225-165	6600		12" Hot Strip Mill	Geared	1920	Illinois Steel Co.	Gary, Ind.	GE
5	300-300	500-300	2200		9" Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
6	300-300	500-300	2200		8" Merchant Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
7	300-150	590-292	2200	60 cy.	9" Merchant Mill	Geared	1920	Cleveland Hardware Co.	Cleveland, Ohio	W
8	350-235	300-200	6600		Merchant Mill	Geared	1920	Illinois Steel Co.	Gary, Ind.	GE
9	350-350	360-240	440	60 cy.	Bar Mill	Coupled		Simmons Mfg. Co.	Kenosha, Wis.	AC
10	400-400	107- 64	2200		16" Bar Mill	Direct	1914	Bethlehem Steel Co.	Lebanon, Pa.	GE
11	400	720-450	2200	60 cy.	Bar Mill	Geared		Cyclops Steel Co.	Titusville, Pa.	AC
12	450	352-230	2200	60 cy.	8" Merchant Mill	Direct	1919	Bourne-Fuller Co.	Cleveland, Ohio	W
13	450-360	440-350	2200	60 cy.	Cont. Hoop (Fin.) Mill	Direct	1920	Connors Steel Co.	Birmingham, Ala.	W
14	450-380	700-595	2200	60 cy.	Cont. Hoop (Fin.) Mill	Direct	1920	Connors Steel Co.	Birmingham, Ala.	W
15	450	730-490	4000	25 cy.	10" Merchant Mill	Geared	1917	Atlas Steel Corporation	Dunkirk, N. Y.	W
16	500-385-250	130-100-65	440		14" Merchant Mill	Direct	1923	Halcomb Steel Co.	Syracuse, N. Y.	GE
17	500-500	327-200	440		9" Merchant Mill	Direct	1913	Bourne Fuller Co.	Cleveland, Ohio	GE
18	500-500-500	500-375-265	2200		10" Merchant Mill	Direct & Belt	1916	Donner Steel Co.	Buffalo, N. Y.	GE
19	500	575-865	2200	60 cy.	10" Merchant Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	W
20	500	575-865	2200	60 cy.	10" Merchant Mill	Geared	1921	International Nickel Co.	Huntington, W. Va.	W
21	{500 / 250}	{880-514 / 440-256}	2200	60 cy.	10" Merchant Mill	Geared	1919	Hunter Crucible Steel Co.	Cleveland, Ohio	W
22	500	888-540	6600	60 cy.	11" Finishing Stand	Coupled		Tennessee Coal, Iron & R. R. Co	Birmingham, Ala.	AC
23	550	320-206	2200	60 cy.	10" Hoop Mill	Direct	1917	Atlantic Steel Co.	Atlanta, Ga.	W
24	600-525	250-125	2200		16" & 15" Merchant Mill	Direct & Rope	1913	Bethlehem Steel Co.	Steelton, Pa.	GE
25	600-600	300-214	2200	25 cy.	Bar Mill	Coupled & Rope		St. Louis Screw Co.	St. Louis, Mo.	W
26	600	300-214	2200	25 cy.	Bar Mill	Chain		St. Louis Screw Co.	St. Louis, Mo.	W
27	600-400-200	321-214-107	440		9" Merchant Mill	Direct	1923	Halcomb Steel Co.	Syracuse, N. Y	GE
28	600-400	375-210	2200		9" Merchant Mill	Direct	1912	Forged Steel Wheel Co.	Butler, Pa.	GE
29	600-600-600	469-375-281	2200		8" Merchant Mill	Direct	1919	Donner Steel Co.	Buffalo, N. Y.	GE
30	600	585-325	500	40 cy.	16" Merchant Mill	Geared	1917	Cohoes Rolling Mill Co.	Cohoes, N. Y.	W
31	600-500-400	600-500-400	2200		Merchant Mill, No. 19	Direct	1916	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
32	600-600	720-360	6600	60 cy.	Hot Strip Mill	Geared		Weirton Steel Co.	Weirton, W. Va.	AC
33	700-600-400	400-300-200	2200		Merchant Mill, No. 10	Direct	1916	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
34	700-600-400	400-300-200	2200		Merchant Mill, No. 10	Belt	1916	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
35	700	485-290	2200	25 cy.	12" Merchant Mill	Geared	1916	Halcomb Steel Co.	Syracuse, N. Y.	W
36	700	730-490	4000	25 cy.	14" Merchant Mill	Geared	1916	Atlas Steel Corporation	Dunkirk, N. Y.	W
37	700	880-530	2200	60 cy.	10" Finishing Mill	Geared	1923	Crucible Steel Co. of America, Park Works	Pittsburgh, Pa.	W
38	750-750	225-168	440	60 cy.	Bar Mill	Coupled		Simmons Mfg. Co.	Kenosha, Wis.	AC
39	750-625-460	360-300-220	6600		12" Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
40	750-600-440	473-375-278	6600		12" Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
41	770-700-630	540-490-440	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
42	800	225-150	2200	25 cy.	12" Bar Mill	Direct	1919	Scullin Steel Co.	St. Louis, Mo.	W
43	800	590-292	6600	60 cy.	16" Hoop and Band Mill	Geared	1915	Weirton Steel Co.	Weirton, W. Va.	W
44	800-400	600-300	550		Bar Mill	Geared	1916	Ludlum Steel Co.	Watervliet, N. Y.	GE

A. C. SPEED SETS—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd By
45	800-800-800	720-600-480	2200		12" Hot Strip	Geared	1920	Canadian Electric Steel Co.	Montreal, Canada	GE
46	800	730-365	2200	50 cy.	22" Bar Mill	Geared	1916	Columbia Steel Co.	Los Angeles, Cal.	W
47	800	730-365	2200	50 cy.	12" Merchant Mill	Geared	1916	Columbia Steel Co.	Los Angeles, Cal.	W
48	800	880-490	2200	60 cy.	16" Bar Mill	Geared	1920	Knoxville Iron Co.	Knoxville, Tenn.	W
49	800	880-623	2200	60 cy.	20" Mer. (Roughing) Mill	Geared	1918	Hoosier Rolling Mill Co.	Terre Haute, Ind.	W
50	840-700-560	360-300-240	6600	40	Merchant Mill	Direct	1925	Bethlehem Steel Co.	Bethlehem, Pa.	GE
51	850-570	214-143	6600		Merchant Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
52	900-710-620	325-257-182	2300		10" Hoop Mill	Geared	1918	Acme Steel Goods Co.	Riverdale, Ill.	GE
53	1000	209-150	6400	25 cy.	24" Flat (Fin.) Mill	Direct	1916	American Steel & Wire Co.	Cleveland, Ohio	W
54	1000	292-150	2200	60 cy.	12" Merchant Mill	Direct	1918	Central Steel Co.	Massillon, Ohio	W
55	1000	590-450	4000	60 cy.	14" Merchant Mill	Geared	1920	Calumet Steel Co.	Chicago, Ill.	W
56	1000	590-450	4000	60 cy.	14" Merchant Mill	Geared	1920	Calumet Steel Co.	Chicago, Ill.	W
57	1000	590-495	6600	60 cy.	24" Structural Mill	Geared	1917	Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	W
58	1100	294-295	2200	60 cy.	20" Merchant Mill	Rope	1912	United Alloy Steel Corporation	Canton, Ohio	W
59	1125-900-675	312-250-187	6600	25	12" Strip Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
60	1190-875-525	350-250-150	2200	40	Merchant Mill	Direct-Rope	1925	Bethlehem Steel Co.	Lebanon, Pa.	GE
61	1180-955-705	560-450-336	2200		Rod Mill	Belt	1916	Keystone Steel & Wire Co.	Peoria, Ill.	GE
62	1200-1150-800	300-214-150	2200		Merchant Mill, No. 10	Geared	1916	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
63	1200-1000-800	300-250-200	4400		14" Merchant Mill	Direct	1919	Buffalo Bolt Co.	N. Tonawanda, N. Y.	GE
64	1200-1000-800	450-375-300	6600		8" Hoop Mill, No. 9	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
65	1200-1000-800	450-375-300	6600		8" Bar Mill, No. 16	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
66	1200-1200-1200	450-360-270	2300		9" Hot Strip Mill	Geared	1916	Trumbull Steel Co.	Warren, Ohio	GE
67	1200-1200-1200	450-360-270	2300		9" Hot Strip Mill	Geared	1916	Trumbull Steel Co.	Warren, Ohio	GE
68	1200-1200-1200	450-360-270	2300		9" Hot Strip Mill	Direct	1916	Trumbull Steel Co.	Warren, Ohio	GE
69	1200-1000-800	450-375-300	6600		8" Hoop Mill, No. 8	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
70	1200-1000-800	450-375-300	6600		18" Band Mill, No. 13	Geared	1919	Carnegie Steel Co.	Youngstown, Ohio	GE
71	1200	505-303	6600	60 cy.	16" Hoop and Band Mill	Geared	1919	Weirton Steel Co.	Weirton, W. Va.	W
72	1200	590-441	2200	60 cy.	16" Duo & Bull Head Mill	Geared	1916	Central Steel Co.	Massillon, Ohio	W
73	1200	590-407	2200	60 cy.	20" Merchant (Fin.) Mill	Geared	1918	Hoosier Rolling Mill Co.	Terre Haute, Ind.	W
74	1250-1000-650	650-500-325	2200		Rod Mill	Belt	1916	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
75	1250	712-430	6600	60 cy.	3 Stand 12" Mill	Coupled		Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
76	1300-900	214-140	2200		12" Merchant Mill	Direct	1912	Forged Steel Wheel Co.	Butler, Pa.	GE
77	1400-1400	600-405	2200		21" Merchant Mill	Geared	1915	Union Rolling Mills Co.	Cleveland, Ohio	GE
78	1500	133-81.5	6600	25 cy.	18" Structural Mill	Direct	1915	Bethlehem Steel Co.	Bethlehem, Pa.	W
79	1500	210-140	6600	25 cy.	18" Bar Mill	Geared	1916	Carnegie Steel Co.	Duquesne, Pa.	W
80	1500-1250-875	300-250-175	2200	50	Merchant Mill	Direct	1925	Southern Calif. Iron & Steel Co.	Los Angeles, Cal.	GE
81	1500-1200-900	320-275-200	2200	60	10" Merchant Mill	Geared	1925	Pacific Coast Steel Co.	So. San Fran., Cal.	GE
82	1500-1250-1000	360-300-240	2200		28" Rail Mill	Geared	1920	Bethlehem Steel Co.	Steelton, Pa.	GE
83	1500	365-244	6600	25 cy.	12" Bar Mill	Rope	1916	Carnegie Steel Co.	Duquesne, Pa.	W
84	1500-1125	375-281	2200		10" Merchant Mill	Geared	1916	Donner Steel Co.	Buffalo, N. Y.	GE
85	1500-1500	450-360	2300		16" Hot Strip Mill	Geared	1916	Trumbull Steel Co.	Warren, Ohio	GE
86	1500-1200-900	468-375-281	6600	25	12" Strip Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
87	1500-1500	514-237	6600	60 cy.	Hot Strip Mill	Geared		Weirton Steel Co.	Weirton, W. Va.	AC
88	1500	514-257	6600	60 cy.		Coupled	1924	Weirton Steel Co.	Weirton, W. Va.	AC
89	1500	590-540	6600	60 cy.	4 Stand 12" Mill	Coupled		Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	AC
90	1600	440-500-540	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
91	1600	440-500-540	6600	25	Hoop Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	W
92	1650-1500-1350	413-375-337	6600		10" Bar Mill, No. 10	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
93	1800-1500-1200	240-200-160	2300		10" Hoop Mill	Belt	1918	Acme Steel Goods Co.	Riverdale, Ill.	GE
94	1800-1800-1800	370-300-247	6600		Sheet Bar Mill	Geared	1920	American Rolling Mill Co.	Ashland, Ky.	GE
95	1800-1500-1200	450-375-300	6600		10" Hoop Mill, No. 11	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
96	1850-1450- 925	120- 94- 60	6600		16" Hand Bar Mill	Direct	1921	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
97	2000-2000-2000	100-83.3-65	6600		12" Structural Mill	Direct	1916	Bethlehem Steel Co.	Bethlehem, Pa.	GE
98	2000	234-161	2200	60 cy.	10" Skelp (Fin.) Mill	Belted	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
99	2000-2000	250-161	6600		10" Skelp Mill	Geared	1915	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
100	2000	250-150	2200	60 cy.	Morgan Continuous Mill	Coupled		Interstate Iron & Steel Co.	Chicago, Ill.	AC
101	2000	350-234	2200	60 cy.	10" Skelp (Rough.) Mill	Geared	1916	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
102	2000-2000-1600	450-360-270	2200		16" Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
103	2000-2000-1600	450-360-270	2200		16" Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
104	2000-2000-1600	450-360-270	2200		16" Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
105	2000-1600-1200	625-500-375	6600	25	12" Strip Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
106	2000-1600-1200	625-500-375	6600	25	14" Bar Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
107	2070-1650-1205	235-187.5-137	6600		20" Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
108	2200-2000-1800	275-250-225	6600		10" Bar Mill, No. 15	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
109	2200-2000-1800	275-250-225	6600	25	18" Band Mill	Geared	1925	Carnegie Steel Co.	Youngstown, Ohio	GE
110	2200	505-303	2200	60 cy.	18" Bar Mill	Geared	1919	Central Steel Co.	Massillon, Ohio	W
111	2300-1300	115.4-65	6600		10" Skelp Mill	Geared	1915	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
112	2360-1880-1440	410-327-250	2200		Rod Mill	Geared	1916	Keystone Steel & Wire Co.	Peoria, Ill.	GE
113	2470-1725-1235	430-300-215	2200		Rod Mill	Geared	1916	Wickwire Spencer Steel Co.	Buffalo, N. Y.	GE
114	2500	354-177	6600	60 cy.	16" Hoop and Band Mill	Geared	1915	Weirton Steel Co.	Weirton, W. Va.	W
115	2750-2240-1750	262-214-167	6600		12" Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
116	2750-2500-2250	275-250-225	6600		14" Bar Mill, No. 14	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
117	3000-3000-3000	155-144-130	6600		24" Structural Mill	Direct	1917	Tennessee Coal, Iron & R. R. Co.	Fairfield, Ala.	GE
118	3000-2500-2000	300-250-200	6600		18" Band Mill, No. 13	Direct	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
119	3000-2500-2000	300-250-200	6600		12" Hoop Mill, No. 12	Geared	1916	Carnegie Steel Co.	Youngstown, Ohio	GE
120	3000	354-212	2200	60 cy.	24" Skelp Mill	Geared	1920	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	W
121	3000	505-300	2200	60 cy.	12" Merchant Mill	Geared	1920	United Alloy Steel Corporation	Canton, Ohio	W
122	3600-1940	290-156	2200	50	21" Cont. Sheet Bar and Skelp Mill	Geared	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
123	4500-4500	500-300	2200		14" Merchant Mill	Geared	1923	Inland Steel Co.	Indiana Harbor, Ind.	GE
124	5000-4000-3000	450-360-270	2200	60	16" Hot Strip Mill	Direct	1925	Trumbull Steel Co.	Warren, Ohio	GE
125	5500-4400-3400	170-136-105	6600		20" Hot Strip Mill	Direct	1920	Illinois Steel Co.	Gary, Ind.	GE
126	7500-4040	250-134	2200	60	21" Cont. Sheet Bar and Skelp Mill	Geared	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE

DIRECT CURRENT ADJUSTABLE SPEED DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd By
1	200-300	360-920	230		Merchant Mill	Direct	1919	Bethlehem Steel Co.	Lackawanna, N. Y.	GE
2	300	300-400	230	d.c.	Cold Rolling Mill	Geared	1914	Trumbull Steel Co.	Warren, Ohio	W
3	300	300-600	230	d.c.	20" x 30" Brass Mill	Geared	1920	W. Va. Metal Products Co.	Fairmont, W. Va.	W
4	300	300-600	230	d.c.	20" x 30" Brass Mill	Geared	1920	W. Va. Metal Products Co.	Fairmont, W. Va.	W
5	300	300-600	230	d.c.	22" x 36" Brass Mill	Geared	1920	W. Va. Metal Products Co.	Fairmont, W. Va.	W
6	300	300-600	230	d.c.	22" x 36" Brass Mill	Geared	1920	W. Va. Metal Products Co.	Fairmont, W. Va.	W
7	300	300-400	230	d.c.	Cold Rolling	Geared	1920	Alan Wood, Iron & Steel Co.	Conshohocken, Pa	W
8	300	315-630	230		8" Merchant Mill	Direct	1919	Donner Steel Co.	Buffalo, N. Y.	GE
9	300	325-650	220	d.c.				Aluminum Company of America	New Kensington, Pa.	AC
10	300	345-500	500	d.c.	Tube Rolling Mill	Geared	1912	Pittsburgh Steel Products Co.	Monessen, Pa.	W

DIRECT CURRENT ADJUSTABLE SPEED DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
11	300	350-450	230	d.c.	Merchant Bar Mill	Geared	1916	Carbon Steel Co.	Pittsburgh, Pa.	W
12	300	350-450	230	d.c.	Lap Welding Mill	Coupled		Gary Tube Co.	Gary, Ind.	AC
13	300	400-800	230		Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
14	300	400-800	230		Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
15	300	400-800	230		Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
16	300	400-800	230		Cold Strip Mill	Geared	1913	Weirton Steel Co.	Weirton, W. Va.	GE
17	300	400-800	230		20" Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE
18	300	400-800	230		20" Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE
19	300	400-800	230		20" Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE
20	300	400-800	230		20" Cold Strip Mill	Geared	1919	Trumbull Steel Co.	Warren, Ohio	GE
21	300	450-750	230	d.c.	Wheel Mill	Geared		Bethlehem Steel Co.	Johnstown, Pa.	AC
22	300	450-750	230	d.c.	Wheel Mill	Geared		Bethlehem Steel Co.	Johnstown, Pa.	AC
23	350	200-300	250	d.c.	9" Merchant Mill	Direct	1919	Natl. Farming Machinery, Ltd.	Montmagny, P. Q.	W
24	350	240-360	240		10" Merchant Mill	Direct	1911	LaClede Steel Co.	St. Louis, Mo.	GE
25	350	240-480	240		10" Merchant Mill	Direct	1923	LaClede Steel Co.	St. Louis, Mo.	GE
26	350	250-325	230	d.c.	9" Merchant Mill	Direct	1921	Wayne Steel Company	Erie, Pa.	W
27	350	300-425	230	d.c.	8" Rod Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
28	350	360-450	230		Welding Rolls	Direct	1920	National Tube Company	Lorain, Ohio	GE
29	350	360-450	230		Welding Rolls	Direct	1920	National Tube Company	Lorain, Ohio	GE
30	350	500	230	d.c.	16" Cont. Skelp Mill	Geared	1924	Gary Tube Co.	Gary, Ind.	AC
31	350	524-850	230	d.c.	18" Blading Mill	Geared	1924	W. E. & M. Co.	South Phila. Works	W
32	360	300-600	230	d.c.	Rod Mill	Direct	1922	United Alloy Steel Corporation	Canton, Ohio	W
33	360	350-500	230	d.c.	7" Rod Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
34	375	430-860	230	d.c.	20" Cold Rolling Mill	Geared	1922	Otis Steel Company	Cleveland, Ohio	W
35	375	430-860	230	d.c.	20" Cold Rolling Mill	Geared	1922	Otis Steel Company	Cleveland, Ohio	W
36	375	430-860	230	d.c.	20" Cold Rolling Mill	Geared	1922	Otis Steel Company	Cleveland, Ohio	W
37	375	430-860	230	d.c.	20" Cold Rolling Mill	Geared	1922	Otis Steel Company	Cleveland, Ohio	W
38	375	430-860	230	d.c.	20" Cold Rolling Mill	Geared	1922	Otis Steel Company	Cleveland, Ohio	W
39	375	430-860	230		Cold Roll Mill	Geared	1925	Otis Steel Co.	Cleveland, Ohio	GE
40	375	430-860	230		Cold Roll Mill	Geared	1925	Otis Steel Co.	Cleveland, Ohio	GE
41	400	200-300	230	d.c.	9" Merchant Mill	Direct	1914	United Alloy Steel Corporation	Canton, Ohio	W
42	400	250-500	230		10" Merchant Mill	Direct	1920	Timken Roller Bearing Co.	Canton, Ohio	GE
43	400	275-500	550		12" Hot Strip Mill	Direct	1916	American Steel & Wire Co.	Cleveland, Ohio	GE
44	400	400-450	220	d.c.	8" Merchant Mill	Direct	1911	Illinois Steel Co.	Milwaukee, Wis.	W
45	450	200-400	230	d.c.	26" x 72" Sheet Zinc Mill	Geared	1924	Illinois Zinc Co.	Peru, Illinois	W
46	400-500	300-600	600	d.c.	9" Merchant—Fin. Mill	Geared	1921	Driver Harris Co.	Harrison, N. J.	W
47	400-200	800-400	230		Copper Sheet Mill	Geared	1925	Rome Brass & Copper Co.	Rome, N. Y.	GE
48	450	400-650	230	d.c.	Rod (1 Stand) No. 2	Direct	1913	American Steel & Wire Co.	Worcester, Mass.	W
49	450	450-600	230	d.c.	12" Cold Rolls (2 Tandem Stands Roughing)	Geared	1915	Superior Steel Co.	Carnegie, Pa.	W
50	450	450-600	230	d.c.	12" Cold Rolls (2 Tandem Stands Roughing)	Geared	1915	Superior Steel Co.	Carnegie, Pa.	W
51	450	550-750	230	d.c.	Zinc Strip Mills	Geared	1925	Matthiessen & Hegeler Zinc Co.	LaSalle, Ill.	CW
52	500	150-225	250	d.c.	12" Merchant Mill	Direct	1919	Natl. Farming Machinery, Ltd.	Montmagny, P. Q.	W
53	500	155-500	250	d.c.	Tyre Mill	Direct	1923	McConway Torley Co.	Pittsburgh, Pa.	W
54	500	200-400	250	d.c.	10" Cont. Rolling Mill	Coupled	1925	Republic Iron & Steel Co.	Youngstown, Ohio	AC
55	500	220-400	550	d.c.	Brass Mill	Geared	1913	Scoville Mfg. Co.	Waterbury, Conn.	W
56	500	220-400	550	d.c.	Brass Mill	Geared	1913	Scoville Mfg. Co.	Waterbury, Conn.	W
57	500	220-400	550	d.c.	Brass Mill	Geared	1913	Scoville Mfg. Co.	Waterbury, Conn.	W
58	500	220-400	550	d.c.	Brass Mill	Geared	1913	Scoville Mfg. Co.	Waterbury, Conn.	W
59	500	220-400	550	d.c.	Brass Mill	Geared	1913	Scoville Mfg. Co.	Waterbury, Conn.	W
60	500	250-325	230		8" Hoop Mill	Direct	1909	Atlantic Steel Co.	Atlanta, Ga.	GE
61	500	250-500	230	d.c.	9" Hoop Mill (Finishing)	Direct	1914	Sharon Steel Hoop Co.	Sharon, Pa.	W
62	500	250-350	600	d.c.	9" Merchant Mill	Direct	1921	Missouri Rolling Mill Co.	St. Louis, Mo.	W
63	500	250-600	250	d.c.	12"-9" Mill	Coupled	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
64	500	300-450	230	d.c.	Lap Welding Mill	Coupled		Gary Tube Co.	Gary, Ind.	AC
65	500	400-600	230		Hoop Mill	Geared	1920	Atlantic Steel Co.	Atlanta, Ga.	GE
66	550	120-300	250	d.c.	10" Merchant Mill	Direct	1923	Firth Sterling Steel Co.	McKeesport, Pa.	W
67	600	150-250	575		6" Hot Strip Mill	Direct	1913	American Steel & Wire Co.	Cleveland, Ohio	GE
68	600	200-300	230	d.c.	9" Merchant Mill	Direct	1914	United Alloy Steel Corporation	Canton, Ohio	W
69	600	200-300	230	d.c.	9" (Finishing Train) Mill	Direct	1915	United Alloy Steel Corporation	Canton, Ohio	W
70	600	225-425	550		12" Hot Strip Mill	Direct	1916	American Steel & Wire Co.	Cleveland, Ohio	GE
71	600	360-440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
72	600	360-440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
73	600	360-440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
74	650	225-400	600	d.c.	Piercing Mill	Geared	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
75	650	225-400	600	d.c.	Piercing Mill	Geared	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
76	650	225-400	600	d.c.	Piercing Mill	Geared	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
77	700	135-360	240	d.c.	Merchant Mill	Direct	1923	Atlas Steel Corporation	Dunkirk, N. Y.	W
78	700	300-400	230	d.c.	Lap Welding Mill	Coupled		Gary Tube Co.	Gary, Ind.	AC
79	720-900	160-200	220	d.c.	Wheel Mill	Geared	1906	Bethlehem Steel Co.	Johnstown, Pa.	GE
80	750	120-210	250	d.c.	14" Finishing Mill	Coupled	1923	Pittsburgh Crucible Steel Co.	Midland, Pa.	AC
81	750	120-210	250	d.c.	14" Finishing Mill	Coupled	1923	Pittsburgh Crucible Steel Co.	Midland, Pa.	AC
82	750	150-250	600		14" Merchant Mill	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
83	700	250-450	250	d.c.	9" Merchant Mill	Direct	1925	Crucible Steel Co.	Pittsburgh, Pa.	GE
84	750	235-325	230		Piercing Mill	Geared	1914	Pittsburgh Seamless Tube Co.	Beaver Falls, Pa.	GE
85	750	300-600	230	d.c.	Cold Rolling Mill	Geared	1924	International Nickel Co.	Huntington, W. Va.	AC
86	750-750	360-860	600	d.c.	14" Continuous Mill	Geared	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
87	800	200-300	500	d.c.	Piercing Mill	Direct	1912	Pittsburgh Steel Products Co.	Monessen, Pa.	W
88	800	200-300	500	d.c.	Piercing Mill	Rope	1912	Pittsburgh Steel Products Co.	Monessen, Pa.	W
89	800	200-400	600		14" Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
90	800	210-315	575		6" Hot Strip Mill	Direct	1907	American Steel & Wire Co.	Cleveland, Ohio	GE
91	800	231-462	600		14" Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
92	800	250-500	230	d.c.	14" and 9" Hoop Mill	Direct	1914	Sharon Steel Hoop Co.	Sharon, Pa.	W
93	800	256-512	600		14" Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
94	800	260-390	575		6" Hot Strip Mill	Direct	1907	American Steel & Wire Co.	Cleveland, Ohio	GE
95	800	275-550	600		14" Hot Strip Mill	Direct	1920	Trumbull Steel Co.	Warren, Ohio	GE
96	800	275-550	700		12" Merchant Mill	Geared	1925	Penn Seaboard Steel Co.	New Castle, Del.	GE
97	800	275-550	700		12" Merchant Mill	Geared	1925	Penn Seaboard Steel Co.	New Castle, Del.	GE
98	800	275-550	700		9" Merchant Mill	Direct	1925	Penn Seaboard Steel Co.	New Castle, Del.	GE
99	800	350-750	600		Cont. Merchant Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
100	800	350-700	600	d.c.	20" Merchant Mill (Breakdown)	Geared	1921	Driver Harris Co.	Harrison, N. J.	W
101	800	360-440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
102	800	360-440	500	d.c.	Aluminum Mill	Geared	1919	U. S. Aluminum Co.	Marysville, Tenn.	W
103	800	370-400	650	d.c.	Aluminum Mill	Direct	1917	U. S. Aluminum Co.	Niagara Falls, N. Y.	W
104	800	370-400	650	d.c.	Aluminum Mill	Direct	1919	U. S. Aluminum Co.	Niagara Falls, N. Y.	W
105	800	400-600	600	d.c.	16" Merchant Mill	Geared	1921	Missouri Rolling Mill Co.	St. Louis, Mo.	W
106	800	410-720	230	d.c.	16" Merchant Mill (Rougher)	Geared	1923	Timken Roller Bearing Co.	Canton, Ohio	W
107	800-363	320-706	600		10" Rod Mill	Geared	1922	Wheeling Steel Corp.	Portsmouth, Ohio	GE
108	800-363	320-706	600		10" Rod Mill	Geared	1922	Wheeling Steel Corp.	Portsmouth, Ohio	GE
109	800-363	320-706	600		10" Rod Mill	Geared	1922	Wheeling Steel Corp.	Portsmouth, Ohio	GE
110	900	425-640	250	d.c.	12"-10" Mill	Coupled	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
111	975-375	650-250	600	d.c.	Rod (Roughing) Mill	Geared	1922	Atlantic Steel Co.	Atlanta, Ga.	W
112	975-510	865-450	600	d.c.	Rod (Finishing) Mill	Direct & Bedel	1922	Atlantic Steel Co.	Atlanta, Ga.	W
113	1000	200-480	250	d.c.	12"-9" Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC

DIRECT CURRENT ADJUSTABLE SPEED DRIVES—Continued

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
114	1000	200–480	250	d.c.	12"–9" Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
115	1000–2000	200–400–600	250	d.c.	12"–10" Gautier Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
116	1000	210–510	230	d.c.	Bar Mill	Geared	1925	Donner Steel Co.	Buffalo, N. Y.	W
117	1000	200–600	600	d.c.	10" Merchant Mill	Geared	1925	McKinney Steel Co.	Cleveland, Ohio	W
118	1000	300–400	230	d.c.	Lap Welding Mill			Gary Tube Co.	Gary, Ind.	AC
119	1000	518–800	250	d.c.	20" Merchant Mill	Geared	1919	Natl. Farming Machinery Ltd.	Montmagny, P. Q.	W
120	1200	150–250	230		12" Merchant Mill	Direct	1920	Timken Roller Bearing Co.	Canton, Ohio	GE
121	1200	300–500	600	d.c.	10" Merchant Mill	Direct	1925	McKinney Steel Co.	Cleveland, Ohio	W
122	1250	175–400	230	d.c.	Rod Mill	Direct	1915	United Alloy Steel Corp.	Canton, Ohio	W
123	1250	175–350	600		14" Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
124	1250	175–350	600		14" Hot Strip Mill	Geared	1920	Trumbull Steel Co.	Warren, Ohio	GE
125	1500	50–80	600		Cont. Merchant Mill	Direct	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
126	1500	100–125	220	d.c.	Light Rail Mill	Direct	1905	Carnegie Steel Co.	Bessemer, Pa.	W
127	1500	100–125	220	d.c.	Light Rail Mill	D rect	1905	Carnegie Steel Co.	Bessemer, Pa.	W
128	1500	100–150	600		14" Merchant Mill	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
129	1500	125–250	230	d.c.	14" Band Mill	Direct	1914	Sharon Steel Hoop Co.	Sharon, Pa.	W
130	1500	125–250	240	d.c.	Strip Mill	Geared	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
131	1500	125–250	240	d.c.	Strip Mill	Geared	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
132	1500	150–300	230	d.c.	18-14" Structural Mill	Direct	1924	Bethlehem Steel Corp.	Johnstown, Pa.	AC
133	1500	150–300	230	d.c.	18-13" Structural Mill	Direct	1924	Bethlehem Steel Corp.	Johnstown, Pa.	AC
134	1500	200–400	600	d.c.	20"–16" Hot Strip Mill	Geared	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
135	1500	200–300	600		10" Merchant Mill	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
136	1500	280–420	600		20" Hot Strip Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	GE
137	1500	280–420	600		20" Hot Strip Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	GE
138	1500	280–420	600		20" Hot Strip Mill	Geared	1922	Otis Steel Co.	Cleveland, Ohio	GE
139	1500	450–550	600		Rod Mills Nos. 16 to 18	Direct	1925	Colorado Fuel & Iron Co.	Minnequa, Colo.	GE
140	1500	470–510	230	d.c.	Rod Mill	Direct	1923	John A. Roebling Sons	New York, N. Y.	W
141	1600	210–420	525	d.c.	Rod Mill	Geared	1913	Steel Co. of Canada	Hamilton, Ont.	W
142	1600	210–420	525	d.c.	Rod Mill	Geared	1913	Steel Co. of Canada	Hamilton, Ont.	W
143	1700	90–140	600		14" Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
144	1700	90–205	600		14" Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
145	1700	250–500	250	d.c.	12"–10" Mill	Geared	1925	Bethlehem Steel Co.	Johnstown, Pa.	AC
146	1750	150–300	230	d.c.	18-14" Structural Mill	Direct	1924	Bethlehem Steel Corp.	Lackawanna, N. Y.	AC
147	1800	115–230	600		20" Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
148	1800	115–230	600		20" Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
149	1800	115–230	600		20" Hot Strip Mill	Direct	1922	Otis Steel Co.	Cleveland, Ohio	GE
150	1800	125–250	600	d.c.	20"–16" Hot Strip Mill	Direct	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
151	1800	125–250	600	d.c.	20"–16" Hot Strip Mill	Direct	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
152	1800	165–350	240	d.c.	Strip Mill	Direct	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
153	1800	165–350	240	d.c.	Strip Mill	Direct	1922	West Leechburg Steel Co.	Leechburg, Pa.	W
154	1800	185–370	600	d.c.	20"–16" Hot Strip Mill	Geared	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
155	1800	185–370	600	d.c.	20"–16" Hot Strip Mill	Direct	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
156	1800	185–370	600	d.c.	20"–16" Hot Strip Mill	Direct	1925	Acme Steel Goods Co.	Riverdale, Ill.	W
157	1800	200–400	600		Cont. Merchant Mill	Geared	1925	Inland Steel Co.	Indiana Harbor, Ind.	GE
158	1800	550–650	250	d.c.	22" Merchant Mill	Geared	1925	Crucible Steel Co.	Pittsburgh, Pa.	GE
159	1850	575–221	600	d.c.	Rod Mill	Direct & Belted	1922	Atlantic Steel Co.	Atlanta, Ga.	W
160	2000	85–165	600		21" Cont. Sheet Bar and Skelp Mill	Geared	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
161	2000	85–165	600		21" Cont. Sheet Bar and Skelp Mill	Geared	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
162	2000	85–165	600		21" Cont. Sheet Bar and Skelp Mill	Geared	1925	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	GE
163	2000	134–275	600	d.c.	10" Merchant Mill	Direct	1925	McKinney Steel Co.	Cleveland, Ohio	W
164	2000	230–460	600	d.c.	Merchant Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
165	2000	230–460	600	d.c.	Merchant Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
166	2000	230–460	600	d.c.	Merchant Mill	Direct	1925	International Harvester Co.	Chicago, Ill.	W
167	2000–1700	210–680	600		14" Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
168	2000	260–800	600		14" Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
169	2100	150–310	600		14" Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
170	2100–1600	150–460	600		14" Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
171	2870–1435	200–400	600		10" Rod Mill	Geared	1922	Wheeling Steel Corp.	Portsmouth, Ohio	GE
172	3000	40–100	600	d.c.	Piercing Mill	Direct	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
173	3000	125–200	600	d.c.	Piercing Mill	Direct	1925	Youngstown Sheet & Tube Co.	Youngstown, Ohio	W
174	3000	150–300	230	d.c.	18-14" Structural Mill	Direct	1924	Bethlehem Steel Corp.	Johnstown, Pa.	AC
175	3000	150–300	230	d.c.	18-13" Structural Mill	Direct	1924	Bethlehem Steel Corp.	Johnstown, Pa.	AC
176	3000	200–360	600		14" Mill	Direct	1924	Jones & Laughlin Steel Corp.	Woodlawn, Pa.	GE
177	3000	325–485	600	d.c.	24" Structural Mill	Geared	1923	Phoenix Iron Co.	Phoenixville, Pa.	W
178	3200	50–120	700	d.c.	28" Structural Mill	Direct	1915	Inland Steel Co.	Indiana Harbor, Ind.	W
179	3500	150–300	230	d.c.	18-14" Structural Mill	Direct	1924	Bethlehem Steel Corp.	Lackawanna, N. Y.	AC
180	4500	67.5–110	500		14" Merchant Mill	Direct	1923	Ford Motor Co.	Detroit, Mich	GE
181	4500	120–255	750	d.c.	Universal Skelp Mill	Coupled	1925	Gary Tube Co.	Gary, Ind.	AC

MULTI-SPEED DRIVES

No.	Horse Power	R.P.M.	Voltage	Cycle	Type and Size of Mill	Method of Drive	Date of Purchase	Name of Plant	Location	Mfgd. By
1	300-300-150	600-400-300	440		Bar Mill	Chain	1916	Vulcan Crucible Steel Co.	Aliquippa, Pa.	GE
2	350-350	150-100	6600		12" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
3	350-350	375-214	6600		9" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
4	400-225	600-300	550		Bar Mill	Geared	1909	Ludlum Steel Co.	Watervliet, N. Y.	GE
5	400-265	875-585	2200	60 cy.	Bar Mill	Geared	1913	Old Dominion Iron & Nail Co.	Richmond, Va.	W
6	450-360	870-695	2200	60 cy.	10" Merchant Mill	Geared	1918	Cleveland Hardware Co.	Cleveland, Ohio	W
7	450-360	875-700	2200	60 cy.	9" Merchant Mill	Geared	1915	National Lock Washer Co.	Riverside, N. J.	W
8	475-350	240-181	440	25 cy.	10" Merchant Mill	Direct	1914	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
9	485-360	870-695	2200	60 cy.	10" Merchant Mill	Geared	1915	Old Dominion Iron & Nail Co.	Richmond. Va.	W
10	500	730-485	2200	50 cy.	8" Merchant Mill	Geared	1919	Southern Calif. Iron & Steel Co.	Los Angeles, Cal.	W
11	500-250	750-375	3000		Merchant Mill	Geared	1923	Consolidated Rolling Mills	Mexico City, Mex.	GE
12	500-400	775-585	550	40 cy	10" Merchant Mill	Geared	1917	Cohoes Rolling Mill Co.	Cohoes, N. Y.	W
13	500-400	875-700	550	60 cy.	10"-14" Merchant Mill	Geared	1916	The Texas Steel Co.	Fort Worth, Texas	W
14	550-360	875-585	2200	60 cy.	12" Merchant Mill	Geared	1917	Norfolk & Western Railroad	Roanoke, Va.	W
15	575-575	375-250	6600		8" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
16	575-575	300-214	6600		10" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
17	600-600	214-93	6600		12" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
18	600-400	514-300	2200		Rod Mill	Direct	1912	Oliver Iron & Steel Co.	Pittsburgh, Pa.	GE
19	800-800	214-167	6600		16" Merchant Mill	Direct	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
20	800-400	600-300	550		Bar Mill	Geared	1917	Ludlum Steel Co.	Watervliet, N. Y.	GE
21	800-363	706-320	600		10" Rod Mill	Geared	1922	Wheeling Steel Corp.	Portsmouth, Ohio	GE
22	800	730-485	2200	50 cy.	12" Merchant Mill	Geared	1919	Southern Calif. Iron & Steel Co.	Los Angeles, Cal.	W
23	800-800	900-720	2200		9" Merchant Mill	Geared	1923	Knoxville Iron Co.	Knoxville, Tenn.	GE
24	800-800	900-720	2200		9" Merchant Mill	Geared	1923	Knoxville Iron Co.	Knoxville, Tenn.	GE
25	800	875-700	2200	60 cy.	16" Merchant Mill	Geared	1920	Kansas City Bolt & Nut Co.	Kansas City, Mo.	W
26	850-850	214-187	6600		10" Merchant Mill	Rope	1916	Illinois Steel Co.	Gary, Ind.	GE
27	850-850	214-187	6600		10" Merchant Mill	Rope	1916	Illinois Steel Co.	Gary, Ind.	GE
28	900-900	214-150	2200		12" Merchant Mill	Direct	1910	Algoma Steel Co.	Saulte Ste.Marie,Can.	GE
29	1100-1500	91	2200	25 cy.	84" Plate (Fin.) Mill	Direct	1910	American Sheet & Tin Plate Co.	Gary, Ind.	W
30	1300-1300	214-187	6600		10" Merchant Mill	Geared	1916	Illinois Steel Co.	Gary, Ind.	GE
31	1800-1800	250-125	6600		22" Merchant Mill	Geared	1913	Bethlehem Steel Co.	Bethlehem, Pa.	GE
32	2000	163-113	6600	25 cy.	10" Merchant Mill	Direct	1909	Illinois Steel Co.	Gary, Ind.	W
33	2500	113-91	6600	25 cy.	12" Merchant Mill	Geared	1909	Illinois Steel Co.	Gary, Ind.	W
34	6500-4500	107-53	6600		60" 3 High Univ. plate Mill	Direct	1909	Illinois Steel Co.	Gary, Ind.	GE

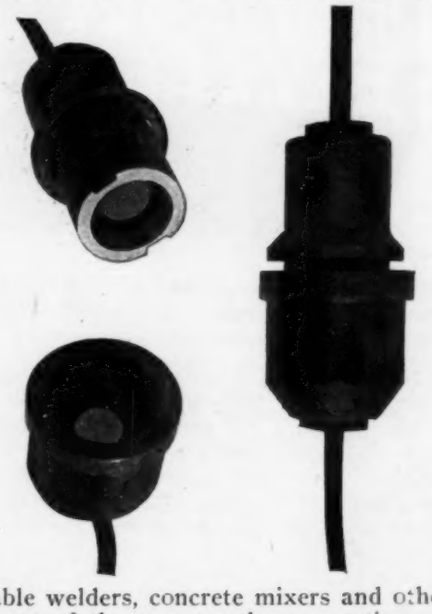
Electrical, Mechanical, Combustion and Safety Developments in the Iron and Steel Industry During the Year 1925

OHIO ELECTRIC AND CONTROLLER CO.

In most operations where lifting magnets are used it is necessary to take the magnet off the crane several times per day and in some cases the crane is constantly shifting from magnet to non-magnet work and usually the rule requires an electrician to connect or disconnect the magnet. This rule is quite proper and should be enforced where ordinary connections are used because if, through carelessness, current is left on the magnet when its circuit is opened, a big, dangerous flash results from the inductive kick.

The ordinary screw connectors soon get worn out and then the ends of the leads and cable are simply twisted together and taped. This work, including the unavoidable delays, will consume an average of 15 minutes' time for the electrician, the crane and the yard crew, and must cost from $1.50 to $3.00 each time.

There are many other operations requiring the making and breaking of electric connections frequently, such as heaters for sheet rolls, motors, driving portable welders, concrete mixers and other tools and in most of these cases, the connection must be of a character which will withstand abuse.



Many mills and other big plants appreciate this cause of continuous delay and expense and have made or sought to buy quick make and break connectors, but with only partial success, because most of them have been too fragile to stand the hard service, so The Ohio Electric and Controller Company, of Cleveland, Ohio, investigated the requirements, designed and made several models and finally developed the Ohio Armored, Weatherproof Connector shown together and apart in the cut below.

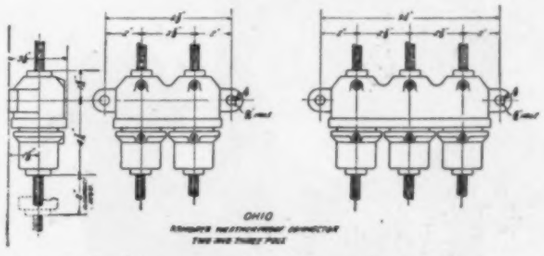
This connector consists of two copper cylinders, one supported rigidly and the other flexibly and which when closed are held in contact by spring pressure of 30 pounds. They will carry a load of 150 amperes continuously or 300 amperes intermittently without rising more than 10 to 15 degrees centigrade.

The insulation is the finest turned bakelite permitting these connectors to be used for any voltage up to 440 A.C.

The upper or exposed end is encased in a heavy cup of cast iron and the lower or plug member is encased in duraluminum, strong but light.

The single pole connector complete weighs 3½ pounds and hundreds of them are out in the hardest kind of service.

In some cases such as for lifting magnets, the upper or socket end is made double pole with ears



as shown by the cut above permitting that part to be attached permanently to the crane block while the two socket members are attached to the leads of the magnet.

For cranes equipped to handle magnets and also motor driven buckets the three-wire connector would be required as also for 3 phase A.C. motor drives.

The butt contact is the easiest to keep in good condition and it will carry the most current when backed by heavy pressure as is demonstrated by the numerous butt contacts on your magnetic switches, your face plate controllers and your circuit breakers.

The upper and lower parts of the Ohio connector are held together by means of a double bayonet lock and the contacts wipe 45 degrees each time the connection is made or opened so that the contact surfaces are kept clean by operation.

The Ohio Armored Weatherproof Connectors make or break connections instantly without the use of tools or tape. They are made by The Ohio Electric and Controller Company, Cleveland, Ohio.

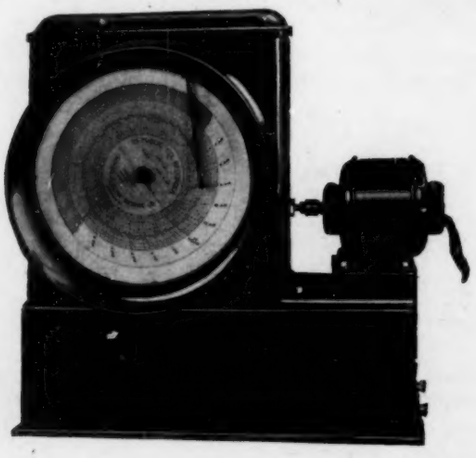
REPUBLIC FLOW METERS CO.

A very important improvement in Republic Flow Meters has been the complete elimination of voltage variation from all reading instruments. This has previously been eliminated from the integrator or totalizer; the recorder and indicator were redesigned

so as to completely do away with this undesirable condition. All instruments are now guaranteed free from inaccuracy due to variation in the line voltage. This improvement has also simplified the instrument in many respects and made them much more rugged than before.

The line has also been supplemented by the addition of a very accurate pressure compensator for use in low pressure steam lines. In steam measurement in high pressure steam lines, the variation of a few pounds does not affect the accuracy to any appreciable extent. When steam is being measured at a pressure of 8 or 10 lbs., a variation of 1 or 2 lbs. in the pressure is a different matter and is sufficient to prevent accurate reading without the use of a pressure compensator. Pressure Compensator is designed to entirely eliminate difficulties due to this feature when metering all pressures up to 40 pounds.

The development of a Liquid Level Indicator and Recorder is another achievement of the past year. This is merely an adaptation of the standard principles of the Republic Flow Meter in a slightly different form. Levels may be indicated and



recorded at any distance from the point of measurement. There are a number of installations giving excellent service where the reading instruments are several miles from the tanks or tail-races in which the measurement is being taken. This same instrument is also used in recording pressures over a long distance.

The CO_2 Recorder has been improved in such a way as to permanently eliminate water trouble. The CO_2 Recorder in use up to the present time has been water operated. It has given excellent service in all districts where there is clean water available. In districts having bad water, however, it has not been a practical instrument. The latest CO_2 Recorder is motor operated, thus eliminating this difficulty. It has been designed to meet long hard usage. All parts are extra heavy, and could easily do double duty without strain or stress.

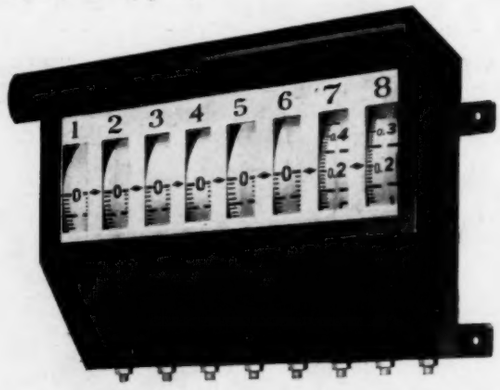
All steel pinions, gears, and worms have been hardened and polished. Bakelite or fiber gears have been used where necessary to reduce the vibration and unnecessary noise. All shafts are made of tool steel and running in brass bearings. All gears and moving parts, except the motor, are immersed in oil, and are thoroughly lubricated at all times.

This oil serves a double purpose—that of lubrication and temperature accuracy.

When the gases are drawn from the furnace into the instrument, they pass through a brass tubing immersed in the oil, then through the pump and more brass tubing before passing to the measuring chamber. In passing through the pump, it is divided into very fine particles and comes into close contact with the metal. This will give it the temperature of the pump and the surrounding oil. It then passes into the measuring chamber, which is immersed in the same oil, and measured at a specific temperature. It passes from that through the potash chamber, then into the final measuring chamber which is immersed in the oil that the pump and first measuring chamber is in.

The oil chamber is directly above and in contact with the potash chamber; therefore, the oil and the potash are the same temperature, or nearly so. If there is a difference of temperature in the oil and potash, they will be corrected in the final measuring chamber, as it is surrounded by the oil. There can be no error caused by temperature irregularities.

It will require about two gallons of ordinary machine lubricating oil, which should be changed every six months or a year.



The Potash chamber holds about three gallons of potash; requiring 12 pounds of the dry potash. This will last from four to six months.

The case of the instrument has been arranged so it is very easy and convenient to change both the oil and the potash. All parts are designed so they are easily accessible and interchangeable. The case is practically dirt and dust proof, as there is no opening except at the top, and that is conveniently covered by a good tight cover.

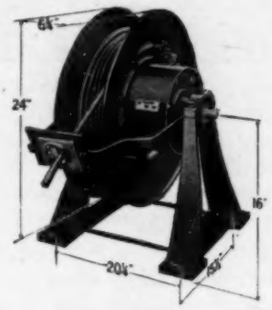
A 1/20 HP motor is used, which is capable of handling a load of two or three times that required. This motor is guaranteed by the manufacturers for one year; and from tests run in our factory and in trial installations, it should run several times that long in actual service.

The Republic line has also been amplified by the addition of the Multiple Draft Gauge. This instrument possesses the important advantage of having all readings on one eye-level. It is also easily read from any direction—above, below or from either side. The zero setting is permanent and practically no attention is required, as a non-volatile oil is used in the seal.

APPLETON ELECTRIC CO.

The Constant Duty Mogul Reelite is designed to operate with machinery functioning continuously for days at a time; and to mount on machinery that is subject to constant or severe jarring. It has an open type drum, with the working elements concealed and protected against weather conditions. It is not furnished with a cable distributor inasmuch as the deep and narrow "U" shaped spool retrieves the cable in even layers. It may, or may not, be furnished with the ball-bearing swivel cable outlet depending upon the installation.

The Constant Duty Mogul Reelite pictured here is equipped with 100 ft. No. 8 gauge two conductor



cable. The diameter of the drum is 24" and the width is 6¾". The bolt holes in the brackets are spaced 16¾" apart. The Constant Duty Mogul Reelite, as installed in a large steel plant, operates in conjunction with an overhead crane, giving continued service for days at a time.

The Constant Duty Mogul Reelite will be made to accommodate 100 ft. of cable ranging from No. 8 gauge to No. 2 gauge in size. Heavier gauges of cable may be used by reducing the length of the cable.

DELTA STAR ELECTRIC CO.

In early station designs the use of petticoat insulators mounted on pins for supporting high tension bus bars and wiring was practically imperative, owing to the lack of supports specially designed to meet conditions. The use of petticoat or line insulators had the advantage of employing a standard part usually available or easily secured.

There were, however, many objections to their use, especially when compactness, flexibility and neat appearance were important. They were not well adapted for horizontal mounting and for installations where a back connected type is necessary the petticoat form could not be used. They could not be easily inspected or cleaned and in compartments the danger of dust or dirt accumulation on the inner petticoat surface is apparent. Owing to manufacturing difficulties, it is practically impossible to secure uniform dimensions of petticoat insulator grooves, heights, etc., and as a result the general "line up" of the bus is apt to be irregular. The large space required is also objectionable, especially when bus bar or wiring compartments are used.

As design progressed the bus supports began to receive closer attention, first by European and then by American engineers. The earlier European designs comprised a corrugated pillar having recesses at both ends into which were rigidly cemented the desired fitting to clamp a bus bar, mount on pipe frame work or flat support.

The practical objection to this early foreign standard was that the rigidly cemented fittings and insulators resulted in an inflexible unit, difficult to install. In case of changes in the number or size of busses, necessity of substituting pipe work or flat base bins, etc., the limitations became very apparent, as it was necessary to remove the entire unit, substituting a second complete unit in its place. The construction was electrically good, but mechanically inconvenient, expensive and cumbersome. It was a rigid, inflexible design not well adapted to American practice.

Another serious objection to the original type was the impossibility of carrying a complete stock, as the fittings of each particular size were rigidly cemented in place and parts could not be interchanged. Shipments were, therefore, slow and the use always had an equipment devoid of interchangeable features.

The next step in design was the "post type" consisting of a corrugated post provided with removable top and bottom clamp fittings. This improved design eliminated the interchangeability limitations of the older pillar type, having rigidly cemented fittings, so the parts could be adjusted or replaced as desired. The disadvantages of the "post type" support were that the method adopted of attaching the top and bottom clamps on the outside of the insulator materially reduced the leakage surface. As the clamps extended over at least one corrugation, this design also necessitated greater, dimensions in order to maintain the same factor of safety secured with the older form of cemented "pillar type supports."

The clamps at top and bottom were also considerably wider than employed with the older "pillar supports," necessitating wider spacings between insulators, greater clearances for height, use of larger bus bar compartments and as a final result a larger sub-station or station building.

Owing to their greater weight and size, heavier and more expensive supporting structures were also necessary than with the pillar form. For moderate potentials, 22000-volts and less, the "post type" insulators were abnormally large and heavy, did not permit of a neat construction and were altogether out of proportion for the work to be accomplished. While the "post type" insulator was an improvement from a manufacturing standpoint, it did not work out so advantageously for the user, especially when making extensions. Owing to the increased size and weight (necessitating greater clearances, etc.) it was frequently an impossibility to install the "post type" in existing substations or wiring systems where a given place had been provided for future extensions.

The problem presented by modern conditions was then given close attention and after consulting experienced engineers the final standard adopted was the Unit Construction. These have all the advantages of the previous types with none of the disadvantages and permit of a flexibility in manufacture,

assembly and installation impossible to obtain in the older forms.

The "Unit Type" wet process corrugated porcelain pillars are recessed at each end and provided with a sanded surface socket in which is cemented a malleable iron thimble—threaded to receive the proper fittings for the service to be met

The advantages of this construction will be quickly appreciated by engineers, as a flat base mounting can quickly be converted to a pipe frame mounting, etc. If future requirements make it desirable to change bus bar sizes it is simply necessary to remove the original fitting and install a new one of different type or size.

The mechanical requirements of bus supports are growing more exacting each year as short circuits on the outgoing feeders or station busses of large power houses develop tremendous short circuit currents, which motorize the busses setting up process between bars which may easily reach values of several hundred pounds per foot of bus.

To determine what stress bus supports will actually withstand exhaustion tests are now part of the routine work of designers and accurate data is available on this subject.

The supports are tested to destruction, and the results of one test are illustrated. As an indication of the progress made in design it is interesting to note that bus supports have been developed with mechanical strength ten times that secured a few years ago with the same dimension of porcelain.

THE TOOL STEEL GEAR AND PINION CO.

In the last year three products have been particularly stressed by our company in an effort to reach the highest possible stage of improvement and distribution. The results have been very satisfactory We have been concentrating on forged Tool Steel hardened crane track wheels, realizing that this was a class of service that demanded the very best product possible. A worn or flat wheel is so detrimental to crane operation and to the whole building structure that any effort to perfect the uniformity of the hardness and lengthen the life of the wheel is greatly appreciated. Intensive study has been given this product until most excellent results have been obtained from it.

In the last few years there has been an increasing demand for leveller machines, especially where the automotive industry was the eventual purchaser of sheet. The rolls used were ordinarily a high carbon steel accurately machined and ground, but these rolls were very likely to scratch or wear and to mar the sheets or need frequent and expensive remachining and dressing. After experimenting with various types of steel, the "Tool Steel" roll, made of alloy steel hardened to approximately 100 scleroscope test and ground all over has proven that it will resist wear and scratching for almost an indefinite period. The difference between the continuous production with these rolls and the frequent shutdowns for dressing of the high carbon steel rolls has had a very noticeable effect upon this department in mill operation.

Mill pinions are coming into stronger consideration as innovations are being tried and used in the form of staggered spur, herringbone and helical pinions. Machinery has been devised that will cut any type of tooth for mill pinion repairs and yet without expensive development charges which would make the price of the individual pinion practically prohibitive Also, test methods have been devised to insure absolute interchangeability in case a Tool Steel part is furnished to run with special gearing of other makes. In the hardening of the mill pinion not only the teeth are hardened, but the bearings are hardened and ground and the wabblers are hard so they resist wear for a very long time and do not need to be frequently built up with electric welding. If a Tool Steel coupling box is used with them the wear on both parts is practically eliminated.

THE HAYWARD CO.

In furtherance of their established policy of keeping pace with the requirements for better ways and means of handling bulk materials, The Hayward Company, 50 Church street, New York, N. Y., has developed a new appliance for use in foundries which employ sand cutters for preparing moulding sand.

The general appearance of this new appliance, which is called an Electric Scraper Bucket, may be seen in the accompanying illustration, Fig. 1. It operates on the general principle used in some of the Clean-up Clam Shell Buckets used for clean-up work in unloading coal and ore on the Great Lakes, except that instead of the opening and closing being entirely accomplished by ropes, it is partially accomplished by ropes and partially by an electric closing unit contained within the bucket.

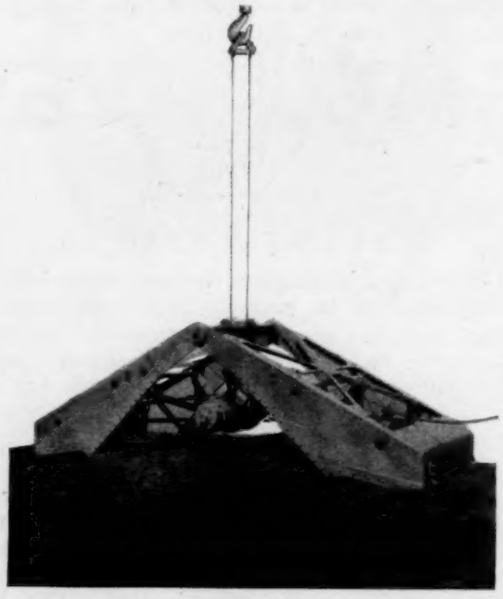


FIG. 1.

The body of the bucket consists of two small shells attached to long lever arms. These shells are drawn together by means of the electric closing unit and they are thrust apart in the opening movement by means of a set of toggle arms pivoted to the top of the closing unit. These toggle arms are actuated by ropes and sheaves on the block and tackle principle.

The opening ropes are secured to a triangular shaped yoke which is attached directly to the hook of an overhead crane.

Since it is not the object of this new type of bucket to lift or transport sand, it has no bottom, that is, the front edges of the shells are cut away so that when the bucket is closed through the sand and raised it forms a neat pile.

The entire process of gathering up the sand on the floor and forming it into piles is managed by the crane operator who controls the bucket, both by the movement of his hook and by a controller mounted in the crane cage which controls the operation of the motor in the bucket through flexible feeder cable.

The bucket is so arranged that it cannot dig down into the floor, the cutting edges being made to travel in a perfectly horizontal path so as to clean the sand from the floor without damaging it.

The bucket can be operated in connection with any of the standard overhead cranes such as are used in modern foundries, the only requirement being that there shall be sufficient headroom for the height of

FIG. 2.

the bucket up to and including the yoke on the end of the holding lines. In operation, this yoke is hooked to the crane hook as shown in Fig. 2. The bucket is lifted and transported to the point where the cleaning up is to be done, and the current is applied to the motor whereupon the chains are paid out and the bucket descends upon the opening line. When it is fully opened it is placed on the floor and the controller is reversed. The bucket closes itself and remains standing in position when fully closed, ready to be lifted and moved to the next cut.

If special shaping of the pile is required, the crane hook is manipulated during the closing movement so that the depth of the cut can be made to suit the wishes of the operator.

This Electric Scraper Bucket is particularly valuable in all modern foundries where a considerable quantity of sand is handled on the floor for the daily cast.

The bucket cleans up a floor area 16′ x 5′ in each cut, leaving the sand in piles approximately 4′ wide and 4′ high. The greatest height required for the bucket is approximately 14′. The bucket can make one cut in about 20 seconds' time.

TRUMBULL ELECTRIC MFG. CO.

Quite a lot of energy has been put into the designing and building of new types of Motor Starting Switches.

A year or two ago in looking over the various types of switches on the market for use with motors, we found that the supply was by no means satisfactory for the demand which was continually increasing. We found that the Motor Starting Switches in general were too large to be conveniently used, and that a good many of them were made cheaply and not up to proper standards.

1—A result of this study and development was our new Tumbler Type Motor Starting Switch that we are satisfied will stand up under severe use and abuse. It is rated 20 amperes, 250 volts; 30 amperes, 125 volts. It has, however, stood up under tests far in excess of its rated capacity.

The switch is very compact, being in a metal box, with galvanized or black enamel finish, only 4" long.

The switch is for use on small motor driven machines, or for use in connection with fractional horse power motors, or on lighting circuits.

One of the smaller but important features of the Switch is the heavy metal guard that is placed around the handle which prevents it from being broken, as is the case with many other similar switches. Also a padlock or seal can be placed in a hole in this guard, enabling the switch to be locked in "off" or "on" position.

2—Another type of Motor Starting Switch developed is our "RM" type Two Position Motor Starting Switch.

On account of its design it takes up the least room of any switch of its type on the market, the box being 8" x 6¾" x 4½", and is almost half the size of the type of Motor Starting Switches that short circuit the fuses while the motor is getting up its speed.

The compactness of the design enables the price to be greatly reduced, and it sells at about half the price of other switches on the market which will not stand up under anywhere near as severe tests as this switch will take.

To operate the switch the handle is thrown clear over, with the fuses out of circuit. As soon as the motor speeds up, the operator guides the handle back

half way into "running" position, the motor being in circuit with the fuses. To throw in 'off" position, throw the handle back.

3—We have further developed our "RM" type of switch by designing an entirely new Motor Starting Switch for use with Time Limit Protective Cutouts.

This design enables one switch to take care of all voltages—110 to 550 A. C.

This new switch, being of the "RM" design (Incidentally "RM" stands for "Rotory Movement," descriptive of the method of operating with the blades placed in the rotor which moves back and forth with the handle, throwing the blades in and out of contact with the clips, which method gives practically a double break effect, and practically eliminates arcing) is very compact, being about two-thirds the size of our former switches for use with these Thermal Cutouts.

4—We have developed quite a number of new types of Meter Service Switches to take care of the various requirements of Central stations in various parts of the country. The line now will take care of all but a few requirements, meeting probably 95% of Central stations' specifications all over the country.

5—We have developed a Residence Panel, low in price, rugged in construction, and neat in design, made according to latest house wiring specifications. This Residence Panel, on account of its low price and its small, compact size, will enable the home builder to remove fuses and control the various house circuits from the kitchen or hallway without going into the cellar and fussing around in unindexed and open plug cutouts when a fuse blows and a renewal becomes necessary.

6—Another point that will interest Iron and Steel Engineers is the fact that our 600 volt Snuf-arc Switches have stood up under direct current tests and have been approved by the Underwriters for use on direct current service from 30 to 200 amperes.

This is one of the few, if not the only, 600-volt Knife Switches approved for D. C. work. This is possible only because of the snuf-arc construction that so effectively breaks the arc and renders operating safe.

There has been a confusion in the trade concerning the use of 500 volt switches on 550 volt or even 600 volt service. It has been claimed by some that for disconnecting work, switches rated 500 volt can be used for 550 volt work, with the approval of the Underwriters, which is absolutely not the case.

Real engineers of our industrial plants realize that on 600 volt work the safest sort of equipment should be used, and have turned toward our Snuf-arc type as representing the last word in safety.

7—We are making continual improvements and developments in the minor parts of our switches, all of which means very much to the user of the article, but which are not important enough to mention specifically as developments.

A Steel Mill Engineer realizes that the difference between one and another type of switch lies not in the general appearance, but in mechanical refinement and proper die work which makes allignment and proper contacting possible when the switch comes to the assembler's bench. Switches, in a way, are apt to look pretty much alike to the casual observer, but there is a vast difference in workmanship.

The Trumbull Company has always made a great specialty of Switch Design, bearing in mind that a safety box with a neat appearance is of great importance, but realizing at the same time that the switch as a whole is worthless if the box does not contain a heavily built switch, carefully made and adjusted—one that is being continually improved to make its mechanical and electrical strength in excess of any normal requirement.

DE LAVAL STEAM TURBINE CO.

Electric motor drive has now come to be the rule rather than the exception. Individual motor drive eliminates overhead shafting and thereby improves lighting, and permits better crane facilities. It also saves floor space and permits of placing machines to suit convenience or efficiency in production, rather than with reference to existing shafting.

Only a few kinds of machinery, however, run at speeds to which electric motors are conformable. A wide range of speeds, varying by small steps, is obtainable with direct current motors, but with alternating current motors only a few fixed speeds are available, and in any case the speeds of commercial motors are generally much higher than those of the driven machinery. Moreover, slow-speed motors cost more, occupy more space, and are less efficient than high-speed motors. High-speed alternating current motors also have better power factor characteristics than do slow-speed motors. These considerations have led to the use of a wide variety of speed transmission devices, such as belts and pulleys, chains and sprockets, and toothed gearing, and more recently, various compact forms of gear speed reducers, including spur gears and worm gears.

In order to obtain any considerable speed reduction with spur gears, it is necessary to use more than one reduction, involving a multiplicity of gears, shafts and bearings. For the sake of compactness, some of the gears may be of the internal type or of the planetary type. The crowding together of gears, however, implies short bearings, or even overhung bearings, and consequent poor alignment after slight wear has taken place. While the efficiency of spur gears may be fairly high at the beginning, it gradually decreases with use, as the teeth do not wear in such a way as to maintain the correct contour. After the teeth have become worn, the driving force is transmitted by a series of blows, which increase in force until the teeth may strip. The latter drawback can be overcome by the use of helical or twisted gears, but in the endeavor to secure compactness, sufficient width of face is generally not provided to insure continuous contact between teeth at the pitch circle. The spur gear type of reducer usually occupies more space than the motor itself and involves placing the motor that much farther away from the driven machine.

The worm and worm wheel type of reduction gear, while widely used, has in the past suffered from incorrect design and from being built in ordinary gear manufacturing establishments having neither exceptional skill nor special equipment. The tooth shape has been that used in spur gear practice, without consideration being given to interfer-

ence, resulting in a small, effective area of tooth contact and relatively low load capacity, and further, while the worm threads are sometimes hardened and ground, the materials used have not generally been those best suited for the purpose, with the result that such gears could be used successfully only where the pitch line velocity was low and the duty light and intermittent, and where efficiency was of little consequence.

However, worm gears combining noiseless running, high efficiency, compact construction and reliability under the most adverse conditions, have lately been developed, particularly in Europe, where they are extensively used in industrial and automotive applications. In America, high-class worm gears have been applied principally in the automotive field, but the De Laval Steam Turbine Co. of Trenton, N. J., has developed a line of worm gear reductions which are applicable to motors and turbines driving such machinery as rotary kilns and coolers, tumbling barrels, agitators, mixers, dryers, mills, calenders, paper machinery, machine tools, stokers, cooling tables, transfer rolls, door lifts, fans, elevators and conveyors of all types.

The design of this gearing has been based upon a careful study of the underlying engineering principles, and the gearing is produced by special equipment. It differs from the ordinary worm gearing in the tooth shape used, in the materials employed, in the treatment of the materials, and in the manufacturing methods and shop control. The tooth shape is such as to combine a minimum of sliding and a maximum of rolling action between the worm and the gear, and at the same time to realize continuously the greatest area of contact. Undercutting of the teeth is entirely avoided, as the included angle of the tooth is approximately 60°, as compared with about 30°, as found in older types of gears. As the pressure line normal to the face of the tooth at the pitch circle falls within the base of the tooth, failure can take place only by crushing, rather than by bending. In ordinary spur gears the projection of this line falls outside the base of the tooth, and such teeth therefore often break off. In our worm gear, three or more teeth are always in contact, giving exceptionally high load capacity for the size and weight, and suiting the gear for heavy duty service.

Owing to the fact that three or more teeth are always in contact there is a smooth flow of power, resulting not only in absence of vibration and noise, but also improving the quality of the work done by the driven machine and prolonging the life of connected machinery, especially of gearing and bearings. This smooth flow of power also permits of increased production, since the machinery can be speeded up, which is not possible with certain other types of reduction, due to intermittent tooth contact in spur gears, or to the tendency of chains to whip or to climb on the sprockets, or to set up vibration, etc.

The reduction is completely enclosed in a casing, which keeps out dust and moisture. The casing is split horizontally in the plane of the center line of the wheel shaft, the lower half is supported by four substantial feet designed to permit air circulation underneath, this giving additional radiating surface. A large oil reservoir with baffles on the bottom serves to settle out foreign matter from the oil. The wheel shaft is carried on plain bronze bearings, so split as to be easily removable without disturbing the wheel shaft or the couplings. The side thrust of the wheel is carried by a hardened, ground and polished steel plate, which bears against the bronze face of the wheel shaft bearing. The worm may be located either above or below the wheel and is mounted on ball bearings, the one at the rear of the worm being of the double type and designed to carry the combined radial and thrust load, regardless of the direction of rotation of the worm. The inner races are pressed on the shaft and the outer races are clamped both radially and axially, adjusting and locating the worm in the case. The bearing at the forward end of the worm is of the radial type, the inner race of which is pressed on the worm shaft, while the outer race has clearance axially, permitting the bearing to adjust itself to the linear expansion of the shaft. This outer race creeps slowly, which distributes the wear over the race way. The bearings are carried in separate housings, so that the case itself is not subject to wear. The worm and wheel and the bearings are lubricated by a splash system, the oil thrown from the gearing being caught in troughs cast on the casing wall and thereby led to the bearings.

The worm is made from a low carbon-alloy steel forging, which is carburized and heat treated after the threads are cut, to obtain a hard surface which will resist wear, and a tough, ductile core which will withstand shock. The heat treatment is carried out in an electric furnace, of which the temperatures are automatically maintained within close limits. The ends of the worm shaft are drawn to remove brittleness and to insure uniform decrease in hardness from the worm threads to the shaft ends. To secure the utmost precision, the worms are finally ground all over, special attention being paid to correcting the distortion caused by the heat treatments, this operation being performed on machines specially developed to maintain a true lead.

The wheels are made from a special composition of prosphor bronze, which gives a low coefficient of friction and possesses toughness and high tensile strength. They are chill cast in dry sand moulds to obtain the maximum hardness, the pouring temperatures being carefully watched by means of electrical pyrometers. For larger sizes the rims only are made of bronze and are shrunk on solid cast iron centers, to which they are secured by threaded keys riveted in place. The worm gear teeth are generated by means of hobs which are fed in axially, tangentially to the gear, this method being used because it gives the greatest possible area of contact and the best tooth shape. To insure a true pitch line the gear wheel is mounted on its own shaft and hobbed on its own bearings, eliminating inaccuracies often found in gears which are pressed on after generation.

Our worm reduction gears are made for transmission ratios of approximately 4 to 1 up to 100 to 1 in one step, and for any higher ratio with double reductions. Power is delivered from a worm reduction gear at right angles to the motor shaft, thus keeping the motor out of the way and often permitting of closer arrangement of machinery

without sacrifice of aisle space. The wheel shaft may be extended to the right or left in both directions. Frames arranged for vertical shaft drive are also supplied. Flexible couplings of the pin and rubber bushing type are used to connect the worm shaft to the driving machine and the wheel shaft to the driven machine.

A Worm Reduction Gear for Vertical Shaft Drive

Worm reduction gears, in addition to reliability, compactness, simplicity and efficient operation, also have the valuable peculiarity that the driven shaft is at right angles to the driving shaft. Where the driven shaft is horizontal, this permits the motor to be located out of the way, alongside the machine, instead of projecting out across aisle space. For vertical shaft drives, it is even more convenient, since it does away with bevel gears and vertical belts, which are always more or less troublesome. It is ideal for vertical agitators, autoclaves, mixers, chaser pan mills, etc.

A worm reduction gear for vertical shaft drive was recently developed by the De Laval Steam Turbine Co., of Trenton, N. J. The gear casing supports the worm bearings and also the lower bearing of the driven shaft, while the upper shaft bearing is held by the casing cover. The oil is carried at such a level that the worm and gear wheel dip into it, thus insuring copious lubrication. The lower wheel shaft bearing is always immersed in oil and has spiral grooves to insure circulation of the oil.

To provide oil for the upper wheel bearing and thrust plate, a small reciprocating oil pump is incorporated in the casing cover. The plunger of the pump projects downwardly against a cam, which may be seen in one of the illustrations just outside of the thrust plate of the bearing, the latter being recognizable by the two oil grooves. The rotation of the cam actuates the plunger, which, by means of ball check valves, draws in oil through the suction pipe projecting from the under surface of the cover down into the oil in the casing. Suitable filling and drainage openings, together with a try-cock, provide for control of the oil level. With this type of speed reducer, inspection of the oil level at long intervals is about the only attention required.

For larger size reductions, where the worms run at fairly high speeds, it is not desirable to immerse the worm and wheel on account of fluid friction, and a positive pressure oiling system is therefore used to feed oil to all the bearings and to the worm threads and gear teeth at the contact points. A full line of these drives is made and drives can be had with the shaft extending either upward or downward.

TIMKEN ROLLER BEARING CO.

An improved type of Timken Tapered Roller Bearing, differing from the well-known Timken Bearing in major refinements but retaining all essential elements which have characterized Timken tapered design, is now in production.

Nickel-molybdenum steel, of special Timken formula, has been adopted for all bearings. The inclusion of the alloys, nickel and molybdenum, produce a steel possessing properties of grain texture, toughness, hardening, heat treating and machining which reflect favorably in the life of anti-friction bearings.

Varied refinements in the bearing itself are noteworthy. The design of the roll has been changed so that the surface of the large end presents a right angle relation to the center line of the roll. The contact then between the large end of the roll and the rib of the cone is in two areas. The rib of the cone being slightly undercut. This two-area contact insures perfect axial alignment between the center line of the roll and the center line of the bearing at all times. Likewise there is always absolute line contact between the surface of the roll and the surface of the cone, and between the surface of roll and the surface of the cup.

An added purpose served by the two-area contact is self-alignment of rolls on cone, in the cup without resorting to a cage fixture to retain the alignment. The primary purpose served by the cage is to retain the rolls properly spaced about the cone and to make the cone with its set of rollers a unit assembly. The skewing of the roll on the cone raceway is impossible, since the two areas on the end of the roll make generously separated points of contact with the shoulder or rib of the cone, as shown in the illustration.

The cage has been improved along with the cone and roller assembly. Previously, the cage was cold pressed into the shape of a cup, the bottom stamped out and the pockets for the rolls punched out, one at a time, by an automatic punch press. The result of this single stamping operation was positive uniformity of cage pockets, yet a progressive error in alignment, due to stretching of the metal, as the indexing fixture advanced the metal cage to the final perforation. To correct this microscopic error, a multiple perforating die was developed which perforates all roll pockets in the cage by a single impact. To further safeguard against any possibility of error during this operation, due to distortion, an inwardly turned flange has been retained on the smaller side of the cage. To insure smoothness and a perfect fit of the rollers in the cage the lateral edges of the cage are swedged inward so that the contour of the sides of the cage pocket conform to the contour of the roll. This operation is termed "winging." Dies similar to the multiple perforator are used, so that all cage pockets are winged simultaneously. The inwardly turned flange and the result of the winging operation are shown in the illustration.

With the advent of more quietly running parts in certain machine installations our company has kept pace by reducing the noise in the bearing to a very marked degree, by the self-aligning principle and the accurately perforated cage. These special installations require a very definite uniform standard of quietness. To accomplish this uniformity, specially tested bearings are required. For this purpose an electrical sound testing machine was developed which measures the noise in a running bearing by means of an electric current. A sounding box connected to a telephone receiver, and a set of radio tubes, carry the amplified noise vibrations of a running bearing to a galvanometer connected to an arbitrarily indexed dial. The human element is removed entirely, the noise being registered with unfailing accuracy on the dial where it can be read by the operator. By the use of this machine it is possible to select bearings to a set standard suitable for the most quiet applications, as well as to locate the cause of the noise.

Although our bearings in use for a number of years showed a remarkably low coefficient of friction, yet the improved type has reduced this materially. The self-aligning properties of the rolls to the cone face admit much higher running speeds. The nickel molybdenum alloy steel, of our special formula, reduces wear, so that in most cases the initial adjustment need never be disturbed. These various refinements make the improved Bearing especially adaptable to all industrial uses, and particularly to high speeds common in machine tools. The tapered construction of cone, cup and rollers is retained, since this is the only type of construction which will carry successfully all loads both radial thrust and combinations of the two without resorting to thrust washers or special thrust bearings.

SMITH & SERRELL

Effective December first, we have introduced a line of improved Francke Flexible Couplings for motor, turbine and engine drives. These will be known as the "Bushed Pin Type." There will be 21 regular sizes rated from 2/3 H.P. per 100 R.P.M. (4000 R.P.M. maximum) up to 3850 H P. per 100 R.P.M. (490 R.P.M. maximum) and for shafts from 3/4" diameter up to 13" diameter.

The improved Francke Coupling retains the best features of the old heavy pattern type and adds several new features to make a better coupling. More and easier endwise movement. Greater power and bore capacities. Much longer life for all speeds. Steel flanges for small and intermediate sizes.

Graphited Bronze Brushes in size No. 850 and larger (bronze bushings in smaller sizes) are removably locked in one flange. The steel pin units are free to slide a full half-inch within these bushings. Contact surfaces are more than doubled; a cylindrical surface is obtained; movement is between steel and bronze; and the graphited bushings present a **self-lubricated surface** that retains its lubricating qualities for many years.

The Francke handles all accidental misalignments—out of center, in an angular direction and endwise; cushions starting and load shocks; absorbs vibrations; runs in either direction; is noiseless

In case of excessive misalignment, it acts as a safety device saving broken or scored shafts, bearing troubles, etc. However, if more than the usual misalignments are expected, due to non-rigid foundations or for any other reason, two couplings in tandem with an intermediate shaft or a Double, Floating-Ring Type Francke Coupling should be used.

Other Francke Features. Easily mounted, aligned and connected without special tools. All metal, no perishable material. No movement or wear on shaft flanges to cause expensive renewal or complete coupling. Simple and safe.

AMERICAN HEAT ECONOMY BUREAU, INC.

This company is looking back on an almost phenominal development during the past year. The business done during 1925 exceeds the total amount of business done in both 1923 and 1924. Steinbart Patent Pressure Burners for boilers and stoves were installed on over 30,000 rated B. H. P. steam boilers and on thirty-one stoves.

In addition thereto, the company took up the equipment of open hearth furnaces, both coke oven and producer gas fired. The experiments with coke oven gas fired open hearth furnaces had already been carried to a successful conclusion in 1924. The feature which during 1924 was not so apparent, was the really astonishingly large saving in cost of upkeep in an open hearth furnace when automatic control was applied to combustion. During the second campaign on No. 6 open hearth furnace at the Trumbull Steel Co. 42,334 tons were made in one run of 409 heats on the same roof, using exclusively coke oven gas as fuel. On inspection of the furnace, it was found that the walls which had been in for over a thousand heats had only burned back 1½" to 2". The average production of these 100-ton open hearth furnaces exceeded 7,000 tons per month and were easily leading the shop. During 1925 two additional open hearth furnaces were equipped for automatically controlled straight coke oven gas firing.

An entirely new development during this year was the Steinbart patented method of automatically controlling producer gas fired open hearth furnaces. This system consists of blowing the air to the producer by fans and automatically controlling the amount of combustion air by the amount of air flowing to the producers for the purpose of making the gas. This method which has been applied to No. 5 open hearth furnace at the Trumbull Steel Company's plant at Warren, O., turned out to be an unqualified success. No. 5 furnace not only leads the other producer gas fired furnaces as regards production and fuel consumption, but also in the cost of upkeep.

The prolongation of the life of the furnace was exceedingly marked. Before the installation of the Steinbart method, this furnace had to be rebuilt after 220 to 250 heats. The first campaign with controlled combustion extended to over 350 heats and then the furnace was taken down for repairs on account of its being next in rotation and not for the reason that it could not have continued for quite a number of additional heats. The coal consumption in this furnace during the campaign averaged about 500 lbs. of coal per ton of steel.

During the year 1925 the company has also started to equip heating furnaces and soaking pits with combustion control, of which quite a number are now going in.

A new feature of the company's business is that it now takes orders for the complete equipment of plants on the basis that the cost of the installation is paid for out of actual savings, so that the benefits of fuel savings on account of the automatically controlled combustion system can now be enjoyed without any actual capital outlay.

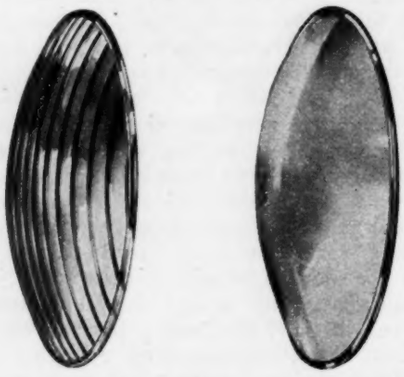
The year 1925 was marked by the extension of the company's business to foreign countries. The first branch office was opened under the name of the International Heat Economy Bureau, Ltd., in London. The business done in England is extremely gratifying and promises to be as important as the business in the States.

THE PYLE-NATIONAL COMPANY

It is interesting, and in a great part true, to assume that prior to the year 1923, industrial plant illuminating engineers and other readers of this article, who have used "floodlighting," had come to regard it as a temporary or emergency method of distributing light, and this attitude is but a reflec-

tion of the nature of the equipment which had up to that time been available for the purpose. Proof of the truth of this assumption could not be had more convincingly than by careful consideration of the make-shift methods which have been generally adopted in the application of floodlighting equipment. The individual attitude, three years ago, was therefore accurately gauged by the experience which each illuminating engineer had had in floodlighting up to that time.

The standards of floodlighting construction and efficiency have in the past been low, with proportionately low standards of cost beyond which no



manufacturer or illuminating engineer seemed able or willing to venture, this, despite the recognized need for cases and construction detail of materials and design which would withstand the ravages of gas and dust-laden atmosphere such as exist about industrial and railroad plants.

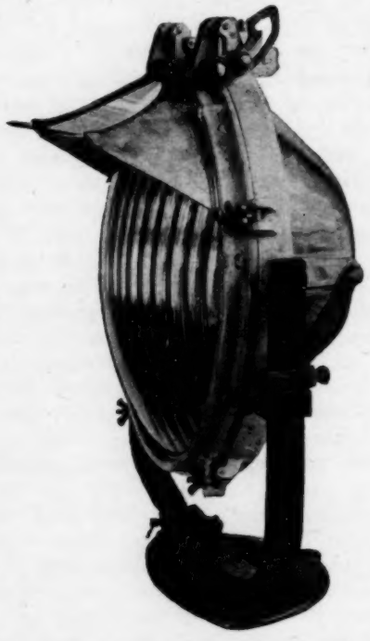
Reflectors were maintained at a very low standard of optical and physical efficiency, in order to keep the cost of floodlighting projectors within the arbitrary limits which had been assumed without adequate justification. It could be expected that the methods of application of such equipment as was available under these conditions should be proportionately inadequate and temporary in nature.

In industrial plant lighting many of the installations require widespread distribution of light over large areas at comparative short range, and it natu! ally follows that the projectors used in such work are required to distribute their light uniformly through a wide, divergence angle, and at an unsuitable angle downward, this angle, becoming increasingly sharp as the mounting location of the projector increases in height. The effect of lamp temperatures upon the glass reflectors, having inferior backing and insufficient annealing, was immediately felt in the blistering and peeling of the reflective surface and in the breakage of the glass. Metal reflectors, with their silver-plated or nickel-plated reflective surfaces, protected by lacquer, were of course subject to still greater rate of depreciation, since the heat burns the lacquer protective coating and causes it to peal, subjecting the silver or nickel immediately to the oxidizing agents in the atmosphere.

The old projector designs, being of a very low order of construction, were poorly protected against the extremes of moisture, dust and insects, since the ventilating ports, as well as the door joints, afforded ample opportunity for such entrance, and therefore rapid depreciation of reflective efficiency, as well as numerous lamp failures were to be expected.

That such a condition could continue for the length of time it did exist, prior to 1923, can only be attributed to a lack of faith on the part of manufacturers in the future of projected lighting or to incorrect conclusions reached as a result of faulty development methods. The Pyle-National Company entered this field at a time when, development was nearly at a standstill, for the purpose of applying experience gained through years of development of turbo-generators and projectors for locomotive electric headlighting to the floodlighting situation, with the hope of producing for the railroads and industrial concerns a light projector which would justify and encourage, through its better construction and by its higher projection efficiency, the adoption of more effective application methods for this class of illumination.

The type 2375 flood light unit with its 23″ diameter reflector, embodies improvements in design, material and construction that assure the elimination of former disadvantages, in addition to the



following new features which cause this projector to stand out as the principle illumination equipment development of the year 1925:

1—Constructed throughout of materials capable of resisting deterioration from oxidation without paint protection.

2—Dust, insects and moisture completely excluded from case interior by elimination of all ventilation ports. The heat of highest wattage standard lamps, successfully dissipated through radiation.

3—Adaptable to use of either standard lamps burning base up or flood-lighting lamps burning base down.

4—Focusing arrangement of utmost simplicity; adjustments of lamp filiament accomplished without opening any part of case.

5—Locks provided on both vertical and horizontal adjustments of body, thus preventing unintentional movement but permitting any operation necessary to

the maintenance of lamp or projector without loss of original adjustment.

6—Reflector of Nonglare or crystal glass and sheet metal plated to resist effects of all ordinary oxidizing and abrasive agents.

7—Refracting lenses available to provide distribution of light suitable to requirements of individual conditions.

8—Visor or hood attachable to secure reflection of salvaged stray light into the field of utilization.

9—Lead wire outlets at top and bottom provided with special outlet bushing to relieve receptacle terminals of any strain which may be imposed upon the leads.

WESTON ELECTRICAL INSTRUMENT CORP.

The accurate measurement of speed is becoming an increasingly important factor in the development of the iron and steel industry.

Engineers fully realize the advantages of having a ready means of checking the speed of such machinery as blowing engines, blast furnace gas engines, driving generators, rolling mills, stokers, blowers for pulverized coal burners, conveyors, etc.

The conditions under which a speed indicator must work are particularly severe. That is, the device must usually be mounted in such a position that it is exposed to dirt and grit of all kinds, moisture, or heavy vibration. The electric speed indicator, if properly designed and constructed, is the type best suited for this kind of work. It has fewer moving parts than speed indicators of the mechanical or hydraulic type; its accuracy is practically permanent since its readings are not affected by wear on the bearings; it may be installed in locations where it would be impossible to use a speed indicator of any other type because of the more or less rigid connection necessary between the speed mechanism and the indicating instrument; its readings may be transmitted to any point distant from the device whose speed is being measured by simply extending the connecting cables, and it requires very little lubrication or attention of any kind when once properly installed.

The Weston Electrical Instrument Corporation of Newark, N. J., has developed an electric speed indicator, especially designed to meet the above conditions. It consists of a D. C. magneto driven from the device whose speed is to be measured, generating a voltage directly proportional to its speed and connected to a voltmeter indicator by means of cables.

The magneto has an armature fitted with a commutator and brushes running in a permanent magnet field and generating a potential of six volts per 1,000 R. P. M.; the speed-voltage curve being a perfectly straight line. The armature shaft is mounted in self-aligning, ball bearings having very little friction and which show practically no signs of wear after years of service. All parts of the magneto are enclosed in a pressed steel case, the whole being mounted in a water-tight cast iron protective housing having a water-tight terminal box at one end containing the cable terminals.

The magneto may be driven by means of a flat belt running over flanged pulleys, a round spring steel belt running over groved pulleys, chain and sprockets, or spur gears, as conditions require. The pulley, sprocket or gear on the magneto is carried by a large deep groove dirt-proof ball bearing mounted on a bracket bolted on the end of the protective housing. The drive is transmitted to the armature shaft through a flexible coupling inside the housing, so that no shocks or strains are transmitted to the magneto from the driving mechanism but are absorbed by the large outboard ball bearing.

All screws, nuts, etc., are fitted with locking devices to prevent their working loose under vibration.

The indicating instrument is a high-resistance voltmeter of the permanent magneto movable coil type having a long, legible scale which may be calibrated in revolutions per minute, feet per minute, gals. per minute, or any units desired. It may be had in several models, probably the most suitable for this work being Model 458 which is enclosed in a water-tight, dirt-proof case.

The indicating instrument is connected to the magneto by means of standard electric cable and the instrument may be placed at any distance from the magneto, provided the cables used are not smaller than No. 14, B. & S. gauge. More than one indicator may be connected to one tachometer, in which case they should be connected in multiple.

The installation and wiring of this device is a simple matter and no electrical adjustments need be made when installing, these all being made before the device leaves the factory.

The accuracy of the indicator is guaranteed to be within 1% when properly installed, and no maintainance work is necessary except to clean the commutator and lubricate the bearings of the magneto at long intervals; about once a year on continuous service. The driving mechanism should be lubricated from time to time as seems requisite.

FAFNIR BEARING CO.

During the year 1925 the Fafnir Bearing Company has been making steady progress in its efforts to promote to the increasing use of Fafnir Ball Bearings on industrial motors. A fairly extensive advertising campaign in leading trade papers, including the Iron and Steel Engineer, has been followed up with personal development work with the leading motor manufacturers of the country, who are developing their line of ball bearings motors.

Both advertising and sales efforts have been based as the special features that a Fafnir Ball Bearing offers for motor service.

Ball Bearings are manufactured in all the standard, as well as a large number of special types and sizes and comprise the largest factory stock of ball bearings in the world, they are available for any conceivable type of motor service.

The Single Row Radial Bearing is, however, the type used on the great majority of motor applications.

Ball Bearings are all of the deep groove style of construction, which has been demonstrated to be the best adapted to the radial loads and the necessity for shock capacity which motor service imposes. This type of construction also gives ample capacity for moderate thrust loads. The deep

grooves, by affording a cushioned spot, rather than point, contact give a firm seat for the balls, enabling them to absorb sudden as well as continuous radial stresses and holding them against the endwise motion produced by the inevitable thrust loads. The Finger Type Retainer, which is without rivets, assures against possible bearing failure due to rivets working loose and falling into the raceways.

The bearings are made from high carbon, chrome molybdenum steel,, thoroughly heat-treated throughcut, which is exceptionally tough and hard without being brittle. Machining, grinding and assembly operation are all inspected, the sub-division of these major operations in many cases having their individual inspection. Every bearing is examined for roughness, eccentricity, fit-up or other defects after it is completed and before it is packed for shipment. Standard limits are close, and where desired, bearings with special tolerances can be furnished. Experience has proved that this care in manufacture should be demanded in all bearings for electric motor service.

The results of these efforts have been a substantial increase in sales to the motor industry and prospects for an even greater increase next year. Among the motor manufacturers who are offering our Ball Bearings in their motors, in some cases as optional and in some cases as standard equipment, are the General Electric Co., the Reliance Electric and Engineering Co., the Louis Allis Co., the Robbins & Myers Co., Crocker-Wheeler Co. and the Star Electric Co.

Along with the efforts to develop sales in the motor industry has gone the effort to increase the knowledge of the advantage of ball bearings and of their care and maintenance.

Research into the operating conditions that govern the use of ball bearings have brought out the following advantages of ball bearings over sleeve bearings for electric motors of the industrial type, such as are used in the iron and steel industry:

1. Short overall length.
2. No shorts from oily windings.
3. Clean bearings.
4 Small constant air gap.
5 Reduced maintenance costs.
6 Thrust load capacity.
7 Repair bills cut.
8 Smaller stock of spares.
9 Belted from any direction, in any position.
10 International interchangeability.
11 Long life.
12 Higher efficiency.

Research has also been responsible for the following instructions regarding the care of ball bearing motors of the industrial type, especially as regards lubrication.

Our company unqualifiedly recommends the use of grease rather than oil for the lubrication of ball bearings on horizontal and vertical general purpose motors, since the correct grease protects the entire bearing as completely as does oil, while having, in addition, certain advantages which oil does not. Grease of the proper consistency does not leak out of the housings, which means that a supply of grease will last for a longer time and also that more efficient motor service will be obtained since the windings are kept clean; problems of enclosure design are also simplified; grease does not leave the bearings exposed to rust by sinking to the bottom of the enclosure when motor is idle; the widespread distribution of suitable greases makes this lubricant easy to obtain; grease in the proper closure assists materially in keeping out dirt; finally, under high-speed conditions, the temperature rise with grease is less than with oil.

The purpose of ball bearing lubrication is primarily to protect the highly-polished balls and races from corrosion, the lack of friction between balls, separator and rings making requirements as a lubricant almost nil. The essential properties of such a grease are as follows:

Consistency as soft as possible—a little stiffer than vaseline; consistency No. 2 or 3 as graded by automobile grease manufacturers.

As high a melting point as possible—180° or higher.

No tendency to gum or harden.

Absence of abrasive or body-giving matter, such as talc, graphite or ground pumice.

Mineral; not vegetable or animal.

Not over .10% free acid or alkali.

Unchanged consistency for lowest outside and maximum motor temperatures.

No tendency to separate while standing.

The quantity of grease is also important; if the housing is too full the separator will churn the grease, which will develop excessive heat and be forced through the end covers. The best practice is to renew with grease to only about one-third the housing capacity. Under this condition a proper grease completely surrounds the bearing without being so thick that it churns. Ideal bearing protection is thus obtained.

For ordinary motor service grease renewal every six months is ample, while on slow speeds once a year will do; the most frequent renewal under any conditions would be every three months. At the time of renewal the housings should be cleaned out with hot, light oil and the packing rings inspected, if these are used. This is also a good time to note the quality of the grease last used by seeing whether it has hardened; this tendency of grease to cake is really what determines the period of lubrication. No grease should be added between periods of renewal, since too much grease is almost as bad as too little for the reason described above. Extreme care must be taken in renewing grease not to let dirt get into the housing.

If the instructions given above regarding lubrication are carefully followed, no other attention to ball bearing-equipped motors will be necessary, under average conditions other than inspecting the bearings at times when the rest of the motor is gone over, at which time, also, the condition of the lubricant may be noted.

The continuous advances that have been made in the knowledge of the advantages and care of ball bearings for motors by the Fafnir Bearing Co. during the past year have been both the cause and result of the increases in sales noted above.

HARNISCHFEGER CORPORATION

The Harnischfeger Corporation of Milwaukee, Wisconsin, have recently designed and built special cranes adapted to use in steel mills. These cranes embody a number of features which fit them for the very severe duty encountered in steel mill operations.

The hoist is arranged with lifting beam and with two hooks spaced 15′-0″ center to center. These hooks are at right angles to the crane girders. Both hoist and bridge motions are supplied by mill type back axle motors. All gears are made of special high carbon heat treated steel with teeth double cut from the solid.

The hoist drive is of three reduction type with a band brake on the motor armature and also a second shaft safety brake. The trolley drive is provided with a foot-operated clamshell brake,

mounted on the armature shaft. The operator's cage is attached to the trolley. Control of the hoist and bridge travel motions is by magnetic switches. The end trucks are made of structural steel, which avoid the shrinkage strains that occur in steel castings. The truck housings, however, are of cast steel. Both ends of the bridge are provided with Lintern sanders to increase the tractive effort of the bridge drive and to speed up acceleration and deceleration.

These cranes are built throughout with a wide factor of safety and with the standard features of quality, design and construction, which have characterized P&H Traveling Cranes for the past 41 years.

ELECTRIC CONTROLLER & MFG. CO.

During the year 1925 several new products bearing the EC&M monogram were announced by The Electric Controller & Manufacturing Company.

The No. 1 Youngstown Safety Limit Stop for limiting the travel of the hook block on cranes, is a new development for hoist motors up to and including 30 H.P., 230 and 550 volts. It is of compact design and therefore easy to mount on crane trolleys where space is limited. It is an absolutely safe stop and built for severe applications. The Youngstown Safety Limit Stop is operated by the hook block itself and it not only cuts off power from the motor, but also applies dynamic braking for quick and uniform stopping. It is automatically reset when the motor is operated in the reverse direction.

The control of synchronous motors has always been considered a difficult and exacting operation, usually requiring special operators. The announcement that automatic synchronous motor controllers by which these motors are put under push-button control have been perfected and are giving highly satisfactory service will no doubt be received with pleasure. The difficulty of starting the synchronous motor will no longer make it necessary to pass up the use of this very desirable motor in the many places where it should be used.

To complete the line of Oil-immersed Starting Switches, the Type ZO Switch was developed. It is used for starting A.C. motors up to 10 H.P. across-the-line and can be used for remote control through push-buttons, float switches, pressure gauges, etc. This switch is enclosed and all of the contacts are under oil, so that it is especially suited to use in places where fire hazards or corrosive atmospheres exist. It has the well-known expansion wire overload device, which gives 100% protection to the motor against overloads and phase failures.

Several Across-the-Line Starting Switches for motors of larger horse-powers have been built this year. These were oil-immersed and they provided the motors with full overload and lost phase protection.

The No. 4, Type S Contactor has been entirely redesigned with improved blowouts and contacts. This Contactor now has a continuous rating of 600 amperes and a mill duty rating of 1,200 amperes.

Four-pole contactors have been made available for use on control boards for operating four motors in quadruplex. For instance, the four motors on the four legs of an ore bridge must be accelerated exactly the same to give an even travel of the bridge. The Quadruplex Control Board, using these four-pole contactors, assures this operation. Typical examples of such control boards are those furnished for the control of the new ore bridge of the Inland Steel Company and the Central Furnace Company.

NORMA-HOFFMANN BEARINGS CORP.

One of the outstanding developments of the past year or two in the iron and steel industries, as reported by the Norma-Hoffmann Bearings Corporation, Stamford, Conn., is the increasing interest in and demand for anti-friction bearings in electric motors.

This concern, as manufacturers of Norma Precision Ball Bearings and of Hoffmann Precision Roller Bearings, is constantly called upon to meet anti-friction bearing problems of all kinds; and the electric motor represents one of the fields where interest in better bearing service is most active. The line of demarcation between the fields for ball and for roller bearings is not clearly defined. But it may be said in general, that ball bearings have their place in motors of smaller powers and higher speeds, while roller bearings reveal their true advantages in motors of larger powers and heavier duties.

In the latter classification come not only motors of the reversing type, but also those used in crane

service, on locomotives, and for general power purposes. For these motors, roller bearings are coming into increasing use because of their larger load capacity, their large, temporary overload capacity, and their ability to resist sudden shocks and jars of service. Not only are many orders being placed for new motors equipped with roller bearings, but large numbers of mill motors with plain or sleeve

FIG. 1.

type bearings have been remodeled, to take roller bearings. The Roller Bearing lends itself with particular readiness to this service, combining (as it does) the speed qualities and anti-friction efficiency of the best ball bearings, with a very much larger, steady load capacity and overload ability. This bearing is of the most simple type, with cylindrical rollers having a length equal to their diameter—a ratio which has been found to give the best results in roller bearing service. (Fig. 1).

The matter of replacing sleeve bearings on existing motor equipment with roller bearings has been given close study, both by engineers of steel plants and by the manufacturers of anti-friction bearings.

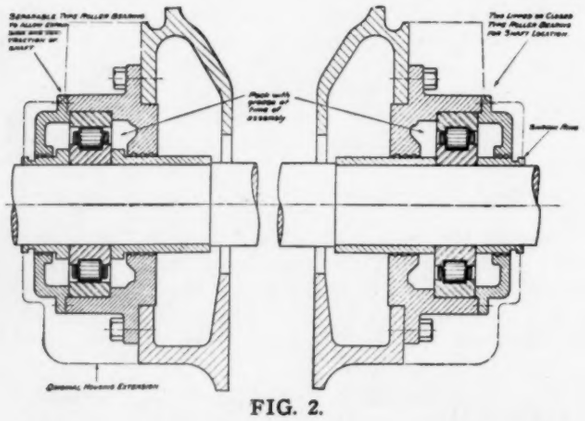


FIG. 2.

A number of successful and, at the same time, simple designs have been developed—one of which (Fig. 2), using Roller Bearings, has been very favorably received.

In this design, a Roller Bearing of the self-contained (two-lip) type is employed at one end of the shaft for positioning the armature while at the other end of the shaft is a bearing of a separable type. This makes possible the rigid mounting of the outer rings of both bearings—thereby preventing looseness and wear and vibration—while unequal expansion of shaft and housings are taken care of by the free movement of the rollers of the separable bearing across the face of the outer ring. It will be noted that the inner ring of both bearings is pressed on the shaft against a shoulder and held by rings shrunk on the shaft.

Of course, each type of motor requires individual study in order to secure the best results where plain sleeve bearings are to be replaced by anti-friction bearings. So successful have been the results thus far as to make safe a prediction that, within a few years, most motors in steel plants will be equipped either with ball or roller bearings—with, of course, a great saving in power, lubricant and up-keep cost.

CHICAGO FUSE MFG. CO.

One of the most noteworthy developments in the design and construction of electrical fuses was brought out by the Chicago Fuse Mfg. Co., Chicago, during 1925. It consists of modifications in the company's line of Union Renewable Fuses of the knife-blade type, which make these fuses exceptionally simple in design and construction.

To fuse users the significance of this development is that features of extreme durability and easy renewal have been added to the consistent and reliable performance which has characterized Union renewable fuses, and these features will serve to minimize the cost of maintenance wherever these fuses are used. Durability is gained by the rugged construction made possible by simplified design, and an unlimited number of renewals is afforded, thus giving maximum length of service. Renewal also is made easy, reducing the time and labor required to a minimum.

The accompanying illustration shows the details of design and construction. When the fuse is taken apart for renewal of the fusible element, there are only three loose parts—the fibre case, to which the threaded brass ends are securely attached; the knife-blades, which are connected by a rigid fibre bar, and to which the fusible element is bolted; and one of the loose screw caps, which hold the knife-blade member in position.

All that is necessary to disassemble the fuse is to unscrew the two caps, and then slip out the entire knife-blade member after one end of it has been shifted slightly to get it out of its locked position. One of the caps can be removed, but the other is held on the knife blade by two nibs. Assembly is accomplished just as readily, and the ease and quickness with which the entire operation can be done, together with the small number of loose parts, reduces time and trouble in making renewals to a minimum.

Extra heavy grey horn fibre is used in the construction of the case, so that it will withstand the pressure developed by the blowing of the fusible element. The brass ends are securely attached to the fibre, and venting, which is an important feature of fuse operation, is accomplished by means of a number of grooves cut longitudinally in the fibre, where attachment is made to the brass ends. After the ends are put on, these grooves become ducts which are large enough and of sufficient number to permit the escape of the gases caused by the volatilization of the fusible element and to relieve the case of the pressure generated; yet they are

small enough, so that the flame is effectually quenched before it reaches the outside. Also, these vents prevent molten metal from getting into the threads of the caps and causing them to stick and make removal difficult.

From the illustrations it also will be noted that the simplified design gives large openings in both casing ends, thus making it easy to inspect or clean the inside.

The knife-blade member, to which the fusible element is attached, consists essentially of two sections of flat copper which are connected by a rigid fibre bar. These connections are made by means of rivets and screws, and the assembly is so rigid and substantial that the copper blades are positively held in position and perfect alignment, assuring permanent contact with the clips. The connecting bar, which is attached by means of screws, may be readily replaced in the event of damage or breakage.

The fusible element makes direct contact with both knife-blades and is held down at each end by a stud and washer. When making renewal these studs need to be loosened only slightly, and the fusible element, which is notched at both ends, can be slipped in and the studs tightened; there are no through bolts, with heads that have to be held or nuts that can be lost or misplaced. The design of the fusible element is an exclusive feature of Union renewable fuses, which blow without violence or flash, fusion occurring midway between contacts, so that the metal parts are always clean.

These new fuses have been fully approved by the Underwriters and are made in all standard ratings —from 65 to 600 amperes, 250 or 600 volts.

THE CUTTER COMPANY

The Cutter Company, makers of U-Re-Lite and I-T-E Circuit Breakers have been pioneers since 1888 in the development of electrical apparatus for the protection of industrial motors, lighting and power circuits.

During 1925 this company has added many new and improved features to its well-known line of U-Re-Lite and Auto-U-Re-Lite Circuit Breakers, in keeping with the constantly growing demands which the increasing use of power for industrial purposes is making upon this type of protective equipment. These circuit breakers are now available up to and including 1250 amperes, direct and alternating current, and direct current, for 440 volts or less.

In the circuit breaker field, they have added to their line of double-throw automatic transfer switches and circuit breakers.

Further improvements have been introduced on the I-T-E remote control rheostat mechanism, so that the movement of the rheostat arm stops instantly with the breaking of the control circuit. A new type of electrically controlled air release has been applied to the solenoid-operated remote control type of breaker, which permits greater ease of operation and dependability.

The synchronous motor starting switches and circuit breakers, both of the hand-operated and the electrically-operated types, have been improved with the addition of mechanical interlocks.

Economy of switchboard space has been gained by a change in the design of the Directite Breaker, which is now made in three-pole form, one pole being mounted above the other, with rigidly connected arms.

The Dalite (direct acting time limit) feature on U-Re-Lite Circuit Breakers, has now been improved to allow for unusually long overload periods.

These are but a few of the most important improvements which this company has introduced during the past year, in carrying forward their long-established policy of keeping abreast with the trend for greater safety and protection, not only of valuable apparatus, but of operatives as well, which has been increasingly evident in every field of power application today.

The improvements and betterments in electrical protective equipment, which are constantly being developed by this company, are proving of practical and lasting benefit to the entire electrical industry, and to innumerable manufacturing industries where economy and safety in the use and application of power are important factors. It is evident that the ideal toward which The Cutter Company is working is to make electrical equipment for the generation and application of power as nearly fool-proof and accident-proof as it is possible to make such equipment, and we do not hesitate to predict still further advance toward the achievement of absolute safety and protection in the handling and operation of electrical machinery, in the years to come, as the application of power to industry becomes more general.

ROLLER-SMITH COMPANY

The Shock-Proof Breaker was a development brought about by the need for a breaker which could be installed under conditions where the vibration or shock might be unusual and where unnecessary opening of the breaker might be attended with serious results. By means of a simple but very efficient supplementary latching device, this has been accomplished in the Shock-Proof Breaker. See illustration No. 1.

In the Interlocked-Trip Breaker the two poles of an independent arm breaker are actuated by a common trip so that the opening of one pole insures the simultaneous opening of the other pole. The two poles can be closed independently, thus dis-

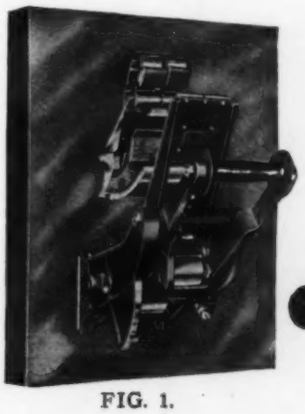


FIG. 1.

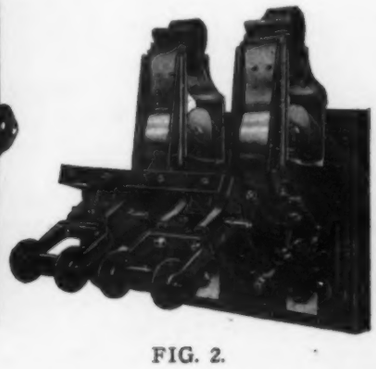


FIG. 2.

pensing with fuses and knife switches for motors and feeder circuits and the like.

The Free-Handle or Non-Closable on Overload Breaker was designed for those conditions where the use of a supplementary knife switch and fuses was not desired and, also, for safety first purposes. As a contribution to safety first the Free-Handle

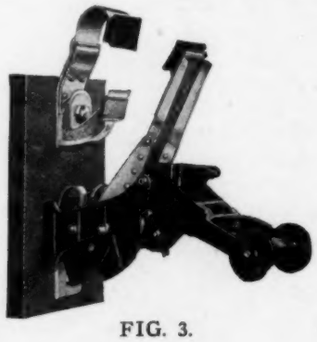


FIG. 3.

Breaker is an outstanding achievement, it being a fool-proof breaker, without a multiplicity of parts. It is available in both open and enclosed types in all combinations and for all requirements.

For installations where the breaker is to be mounted on the rear of the switchboard or panel, with the operating handle and target on the front, the Dead-Front Breaker meets all requirements. The operating handle on the front being dead, the operator is free from all danger of shock and flash.

For crane service a breaker having as many poles as there are wires to the circuit and as many overload coils as there are motors has been much in demand and the Multi-Coil Crane Type Breaker meets the requirements exactly. In case of an overload on any one of the motors the breaker will open, thus disconnecting all the crane motors from the line.

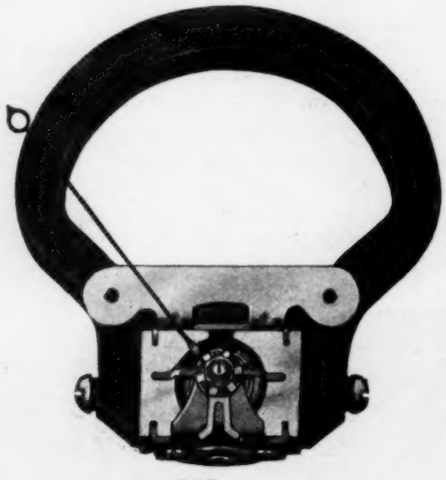


FIG. 4.

For those conditions where a self-contained time limit attachment is preferred to a separate time limit relay, Roller-Smith has developed and will shortly market, its new direct-acting, self-contained time limit attachment for its breakers. Being positive in its action, free from complications and requiring practically no attention, this new breaker accessory will fill a long-felt need, particularly in steel mills, where the operating conditions are frequently quite severe.

This company has recently developed, and will shortly put on the market, a new self-contained reverse current breaker of such a simple and ingenious design as to create a distinct departure from

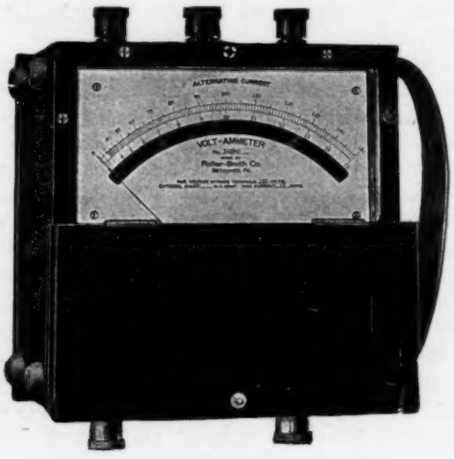


FIG. 5.

the usual design employed for reverse current protective devices.

The small D'Arsonval instruments for direct current, Types TD, FD and HTD, now have a new and very much improved mechanism designed especially for small instruments.

For the first time a combination volt-ammeter for alternating current is now available in commercial form, the Type GSA. Instead of attempting to modify a single mechanism to serve both as an ammeter and as a voltmeter the Type GSA employs separate mechanisms, mounted one above the other on a common staff, and having a common pointer, much as is done in the case of polyphase wattmeters. Almost any combination of ranges may be supplied.

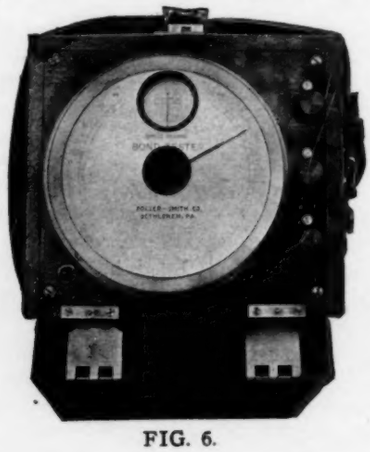


FIG. 6.

For weighing very light bodies and, particularly, incandescent lamp filaments, Roller-Smith has made up for one of the leading lamp makers a Precision Torsion Balance, having a range of 25 grams, and another of 50 grams range. The significance is that, while balances having ranges as high as 2 M. G. have been supplied for many years, this is the first

time it has been found possible to supply ranges as high as 50 grams in this type of balance.

Roller-Smith has developed, and will shortly market, a new Bond Tester, having ten times the sensitivity of the most sensitive device it has heretofore made. With this new Bond Tester, it is possible to test rail bonds on street railways and in mines with such a small current in the rail that one ordinary No. 6 dry cell (attached to the contact bar) will supply sufficient current to test a large number of bonds.

MARLIN-ROCKWELL CORP.

Rapid progress has been made in the application of anti-friction bearings to electric power units within the last few years. Particularly is this true with respect to the use of ball bearings in electric motors.

The success of pioneer attempts at equipping electric motors with ball bearings encouraged the more extensive use of that form of bearing for this purpose. The knowledge gained during this period of development has been capitalized on to the extent that there are electric motor builders today who concentrate on the manufacture of ball bearing equipped motors only. The many advantages attendant on the use of ball bearings for this purpose was discovered early and the field of use of ball bearing-equipped motors was enlarged as a consequence, until today there is no field to which the ball bearing equipped motor will not apply. The early applications disclose that in order that the merits of ball bearings be continuously available, the matter of reliability in operation must be given close attention. It was soon discovered that bearings suitable for automobile application, the greatest field of use for the ball bearing, would not do for electric motors and meet the demand for continuous heavy service. As a result, marked improvements have been made in the construction of ball bearings themselves. By far the largest field of application for the ball bearing motor is in the iron and steel industries, and this field has been fertile in the development of the ball bearing equipped motor.

Materials of bearing construction have improved considerably. In the early days ball bearings were obtained from foreign manufacturers. Manufacture of ball bearings was necessarily established in this country, but materials were still purchased in European countries. Today American steel manufacturers have improved their equipment and processes to such an extent that they furnish by far the best steels for ball bearing purposes that can be obtained. Steels are more uniform in chemical analysis, purity and homogeneity. The development in heat-treatment methods have been rapid, to the extent that the steels used in manufacture of ball bearings are given the necessary density and hardness to give the durability and reliability necessary for ball bearing performances. The recent advent of molybdenum as an element of content in chrome molybdenum steel for the manufacture of larger sizes of steel balls has resulted in more uniform structure, greater crushing strength, and longer life of these load-carrying elements of the bearing.

It has been found by at least one manufacturer, the Strom Division of the Marlin-Rockwell Corporation, that the size of balls in annular ball bearings, the type generally used in electric motor application, could be materially increased without sacrificing any appreciable amount of the strength of the rings, which, when mounted on a shaft and in the housing, are entirely and uniformly supported, furnishing merely the grooved, hardened wearing lining of the shaft and in the housing on which the balls roll. The consequence of this important development is that capacities for corresponding sizes of ball bearings have been increased as much as 38%.

Ball retainers in ball bearings have always been a seat of development in the construction of ball bearings, the purpose of this element in this construction of the bearing being to separate the balls and maintain their correct working relation in the bearing. This is subject to some wearing influences and application of stress. There was little early knowledge of the duties of this part of a ball bearing and its behavior under these influences. Therefore early retainer construction was crude and inadequate. These have been strengthened and their form made more accurate so that today they offer a very small problem in obtaining the satisfactory performance of ball bearings in electric motors.

Manufacturing equipment and workmanship have improved so that the maintenance of uniform boundary dimensions of ball bearings is insured within much closer limits than have been heretofore known. In fact, the commercial manufacture of large quantities of ball bearings made to stringent tolerances measured in tenths of a thousandths of an inch is one of the most remarkable achievements of mechanical industry, and this fact has been largely responsible for the acceptance of this type of bearing for electric motor use.

There have, of course, been improvements in the construction of electric motors themselves in the provisions for the necessary housing and mounting of the ball bearings. Considerable knowledge has been gained by manufacturers as to necessary accuracy, and machining methods and workmanship have improved in this direction. Methods of handling maintenance and lubrication of ball bearings, upon which rests largely the attainment of successful performance, has been given very earnest attention by manufacturers and users to the extent that the ball bearing motor in the factory today is the most reliable power unit known.

NEW DEPARTURE MFG. CO.

Probably one of the most noticeable developments in the use of ball bearings during the past year has been a more general appreciation on the part of electric motor users of the real tangible advantages to be obtained from the operation of electric motors on ball bearings.

Running almost parallel with this has come a development and production of standard or semi-standard lines of ball bearing electric motors of the general purpose ratings and type by nearly all the electric motor manufacturers. This very noticeable increase of interest in ball bearing motors on the part of both users and manufacturers can be traced

to actual experiences with ball bearing motors so freely discussed and described by various members of the Association of Iron and Steel Electric Engineers dating back several years, and more recently a general publicity by ball bearing manufacturers, emphasizing the merits of the ball bearing electric motors, as again proven by actual experience.

Maintenance engineers have shown a very decided increase in the details of the ball bearing installations such as the selection of bearings of ample capacities, methods of mounting and locking on the shaft, types of closures used and methods of securing the final sealing, and lubrication. All of these details are of live interest to the Maintenance Engineer, as his success or failure is measured by his ability; first to avoid shutdowns; and, second, to keep maintenance costs at a minimum.

The ball bearing is today very generally the standard bearing for vertical shaft electric motors, as the ball bearing not only has ability to properly locate and support the rotor, but also adds a characteristic to the vertical motor which it has not possessed when built with other types of bearings, namely, the ability to carry very large suspended external loads such as the runners of deep well pumps, fans, fan rotors and other similar driven parts.

The expression of interest in the ball bearing electric motor comes from such a broad field of manufacturers, dealers and users, and also from users with widely varying operating conditions, that there is every indication that the ball bearing will become the standard bearing in general purpose motors in the near future.

THOMPSON ELECTRIC CO.

One of the most progressive steps that can now be taken in the industrial safety movement is the development of safe processes to replace those which have to be safeguarded. What we need is not 'more guards,' but more processes which do not have to be guarded.

It is being demonstrated that good light is the least expensive and most efficient means known for stimulating production and promoting safety; which, by the way, are the only reasons for having industrial illumination at all.

Production and safety are constantly becoming more and more closely knitted together—and production develops as this fact becomes recognized. Industrial accidents are essentially wasteful, and in these days, when everybody is straining for efficiency, wasteful accidents are unthinkable.

The cost of all industrial lighting equipment is now so low that, whatever the price paid, it will be insignificant when compared with the value of the illumination in the industry.

Furthermore, to produce and distribute the light in the working area is only one part of the problem, for it is equally important to safeguard that light from an enormous and wanton waste due to dirty equipment.

This is where the Safety Lowering Switch plays its important part, first by substituting a safe practice for a hazardous one through the elimination of climbing hazards and electrical hazards, and secondly by making the work of reflector-cleaning so easy that it is much more likely to be done—thus helping to safeguard light from the wanton waste which is bound to occur when the reflectors are so installed as to be difficult or dangerous of access. It is becoming a well-recognized fact that dirty reflectors do not reflect.

The Thompson Lowering Switch or Hanger always has operated successfully in certain places. Hangers of the earlier design and construction could now be installed under some conditions and give complete satisfaction. Some of the earliest Thompson Hangers made are still in use; but the Hanger

FIG. 1.

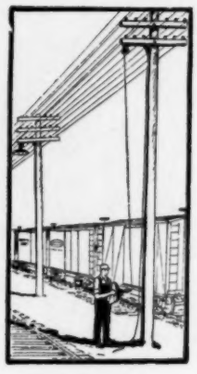


FIG. 2.

has been going through a continuous process of development and improvement for the purpose of adapting it to a wider and wider range of conditions. That is why it is now giving such great satisfaction in places where more or less difficulty was encountered in the earlier stages of its development Some of the improvements are so inconspicuous that the chances are they might not be noticed in a casual inspection, but they are there nevertheless, and make the Hanger just that much better.

One of the recent developments is a provision for enclosing the chain in conduit—again for safety, for the conduit can be extended directly through a danger zone, with complete assurance that the chain is safe. A totally enclosed corner pulley, No. 149, has been developed for use wherever the chain is enclosed in conduit.

Model No. 95, which was really designed for other service, is now finding its way into steel mill use because the upper member has no external opening into the sheave housing—and provision is made for both the wiring conduit and the chain conduit to be screwed into the Hanger on the ceiling or girder line. This constitutes a substantial forward step in the elimination of dirt and corrosive elements.

One of the very important improvements involved in the later model is the swivel method of dead-ending the chain in the Hanger by the use of two convex washers, permitting the lower member of the Hanger, carrying the lamp, to rotate freely around the chain and enter the upper member without unnecessary jamming or binding. All users of the later model should take advantage of this swivel method of dead-ending the chain. Flat washers should not be used, as they involve more friction and binding than is necessary.

THE MARTINDALE ELECTRIC CO.

During the past year The Martindale Electric Co. has added several new articles to its line of Motor Maintenance Equipment.

One of the most interesting additions is the Electrical Etcher, illustrated in Fig. 1.

It consists of a small transformer with one lead equipped with a handle to hold the etching points. The other lead can be attached to either the contact plate, which has a spring to hold the work, or can be clamped to an edge of the work by means of a spring clip.

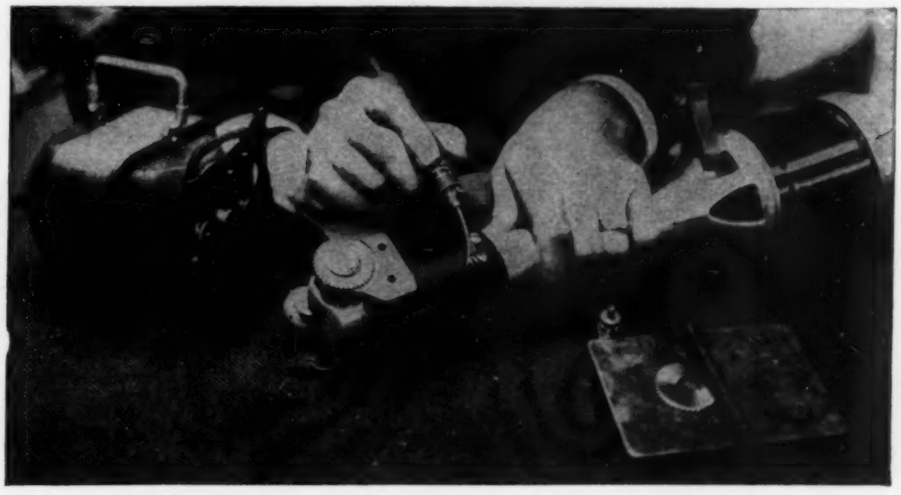


FIG. 1.

Three taps are provided for light, medium and heavy work.

The etcher burns the marks into steel or iron parts and is very convenient for marking tools, saws, cutters, gauges, dies, gears, shafting and numerous other articles. The cost of operation is practically nothing.

The Soldering Transformer, illustrated in Fig. 2, is built on the same principle as the etcher, but the windings are different in order to provide the necessary heat for rapid soldering.

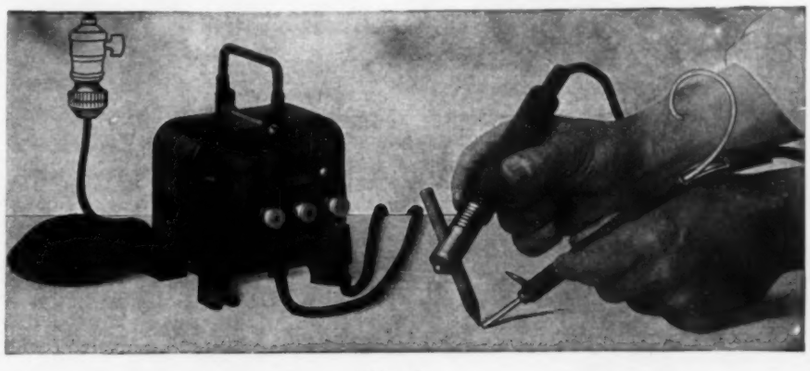


FIG. 2.

It is built in two sizes, the Standard of 250 watts capacity, and the Heavy Duty of 500 watts capacity.

As there is no waste of current when the points are not in use, it consumes less current than an electric iron and the direct heat requires much less time to heat the joint.

The Standard Solderer is provided with three taps and the Heavy Duty with five taps for different degrees of heat.

For many year our company has specialized in Commutator Stones and Commutator Slotting Equipment. They offer a large selection of slotters, of which the Imperial Undercutter is the best known. During the past year they have added a new slotter, see Fig. 3, which promises to become very popular.

It is small and light. The small diameter saws used make it easy to follow the mica and permit undercutting to within 5/16" of the risers. The motor is universal and is made for 110, 220 or 250 volt service.

Imperial Wash-er Clean is a non-conducting, non-combustible liquid that cuts and then absorbs the grease.

While it was developed primarily to clean armatures, fields, brush rigging and commutators, it is not injurious to delicate instruments or fabric, and may be used for cleaning sewing machines, typewriters, adding machines, clocks, meters, clothing, and, in general, to remove grease from any surface.

Its non-combustibility removes the fire hazard and is, therefore, much safer as well as more effective, than gasoline.

Imperial Cleaner is another new product developed this past year. This is a paste developed particularly for cleaning slip rings and commutators and will entirely replace sand paper, but is not intended to replace Commutator Stones.

Probably its greatest field is for removing the glaze on slip rings of A.C. motors, especially where they are started and stopped frequently.

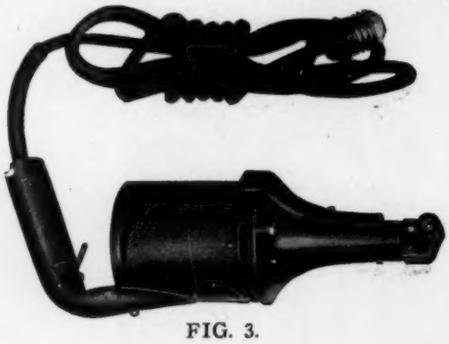


FIG. 3.

It has been found that the frequent removal of the glaze cuts down the resistance between the brushes and rings enough to reduce the starting time from 15 to 30 per cent.

It is put up in paste form in a can of about the size of ordinary shoe paste.

Their Commutator Slotting Saws supplied on their undercutters, have been giving such satisfactory service and long life that they have recently

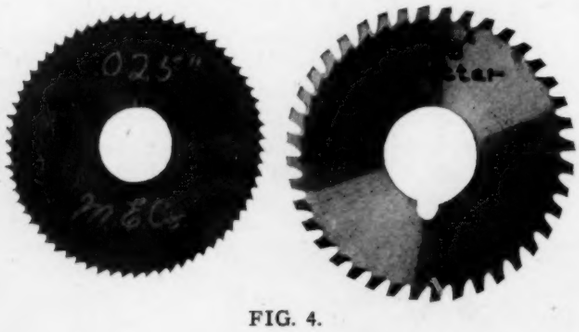


FIG. 4.

begun the manufacture of saws for other makes and expect to soon have a complete stock of saws for immediate shipment in all the sizes in common use.

Fig. 4 illustrates two styles and at the same time gives an example of the marking done by the Electrical Etcher, illustrated in Fig. 1.

SKF INDUSTRIES, INC.

Our outstanding contribution to the iron and steel industry has been the development of the Skayef Self-Aligning Roller Bearing and its successful application to steel mill motors and other important locations. It has been designed to meet space limitations where greater compactness for a given capacity is required. It is a self-contained unit retaining practically all of the smoothness of operation and low friction qualities of the Skayef Self-Aligning Ball Bearing.

In this bearing the outer race is ground to a hollow sphere, which permits of the free self-alignment of the bearing. The rollers are of barrel shape and each of the two rows of rollers is permitted to operate independently of the other. The retainer may be either of steel or bronze, according to conditions of service, the function of which is spacing or separating the rollers.

The actual guiding of the rollers is controlled by guide rails integral with the inner race. The self-aligning feature of the bearing allows for considerable misalignment without setting up stresses in either the rollers or raceways. The bearing is capable of accepting thrust loads in either direction

FIG. 1.

FIG. 2.

The capacity to compensate instantly and automatically within itself for any misalignment or shaft deflections under severe load conditions is the outstanding characteristic of this bearing.

In the last analysis, the absolute reliability of ball and roller bearings as applied to motors and steel mill machinery is probably one of their greatest assets. When properly designed housings are used, practically no attention is necessary and certainty of performance is assured. How far ball and roller bearings can go towards guarding against freedom from trouble is best illustrated by their adoption in many varied industries the world over.

CROCKER-WHEELER ELECTRIC MFG. COMPANY

During the year 1925 the Crocker-Wheeler Company made great progress in meeting the increasing demand for motors with anti-friction bearings. They developed and put on the market an entirely new line of induction motors, limited, however, to the narrow range of 1/2 to 2hp, 1800-rpm, equipped with ball bearings.

They also developed two new lines of D. C. motors, ranging from 1-HP at 1750-rpm up to 85-HP at 1750-rpm, also with ball bearings. These motors are the form "F" line from 1-Hp to 7½-HP at 1750-rpm in six frame sizes, non-interpole; and also, the form "H" motor in seven sizes of interpole type ranging from 7½-HP at 1150 to 85-HP at 1750, constant speed and also for adjustable speed work in speed ranges up to 4:1.

Considerable progress was made in the development of new designs of induction motors with anti-friction bearings, motors from ½-HP at 900-rpm up to 250-HP at 3600 rpm now being in successful

operation, and also in the development of fully enclosed induction motors for operation in the presence of very dusty and chemical-laden atmospheres.

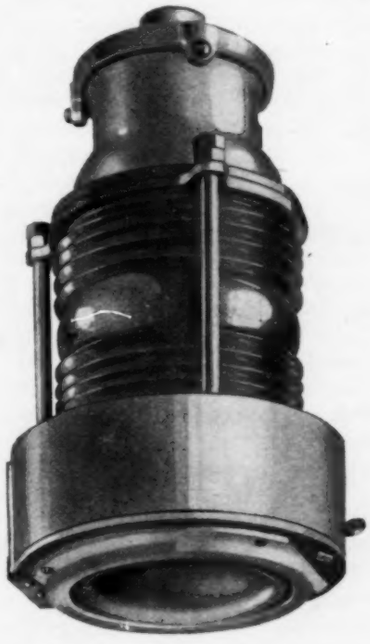
The company also placed on the market a line of automatic remote control starters for squirrel cage induction motors ranging from 7½-HP up to 30-HP at 220-volts; up to 60-HP on 440 and 550-volts, 60 cycle and up to 25-HP, 220, 440 and 550-volts, 25 cycle.

These starters are characterized by simplicity of construction, there being but one lifting magnet; all contacts are broken in oil and they are equipped with the usual protection against low voltage or overload.

On November 2nd the company changed its corporate name to the Crocker-Wheeler Electric Manufacturing Company, so that its name would more clearly indicate the nature of its business.

THE NICHOLS-LINTERN CO.

The N-L No. 105 Universal Lantern was designed especially for purposes where oil lanterns are used for danger or warning signals. It is equipped for two lamps, one being focused back of a 5" fresnel lens and one being focused for the lens in the base. Should either lamp fail, the other performs the double duty until a replacement is made. Its extraordinary brilliancy makes a very strong warning signal. Owing to the construction of the lantern,



which is of cast aluminum alloy, the renewal of lamps is very simple and it can be done without disturbing the lenses or lantern in any way.

The Lintern Electro Magnetic Sanders are now being equipped with Chromalox Electric Strip Heaters. This heater is connected permanently to the line and provides for a heated air chamber at all times. This air chamber surrounds the sand and keeps the sand dry and in easy flowing condition.

BUSSMAN MANUFACTURING CO.

Every engineer or man with an analytical mind should be interested in the design of the renewable fuses made by the Bussmann Manufacturing Company.

The design used in our Renewable Fuses has evidently been painstakingly and scientifically studied out to eliminate as far as possible every chance for poor contact either in use or in renewing the fuse. The mechanical perfection that has been attained is truly remarkable.

Every part of our Renewable Fuse has been designed to serve some specific and useful purpose. Every useless or unnecessary part has been discarded. In the ferrule contact type of fuse there are only four parts and the link is to be handled in renewing. The knife blade type has but three parts and the link.

This extreme simplicity of design makes correct renewing such a simple and easy operation that faulty renewal is next to impossible.

The elimination of faulty renewal means the avoidance of poor contact. With good contact the fuse user is not worried with charred fibre tubes, clips losing their temper due to heating, premature or unnecessary blows or many of the other ills caused by fuses overheating.

THE CLARK CONTROLLER CO.

The accompanying cut, Fig. 1, shows a Face Plate Type Controller of an old well-known design in which, during the past year, some important improvements have been incorporated by The Clark Controller Company of Cleveland, Ohio. In this improved manual controller the frame complete with top and base is made from Pressed Steel Plate, making a saving in weight and maintaining the necessary rigidity.

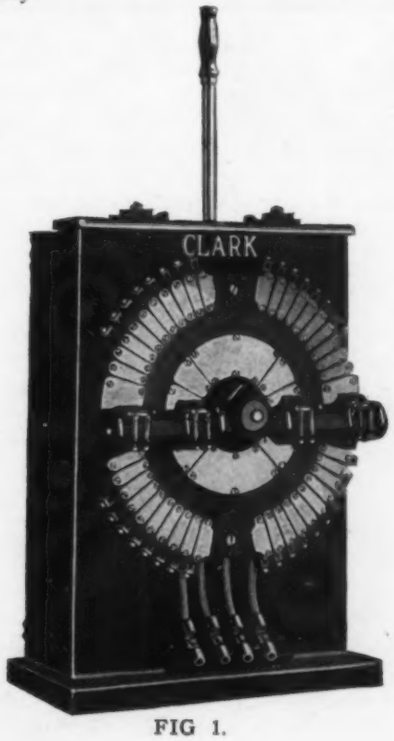


FIG 1.

Cast grid resistors have been completely discarded and the frame is designed to accommodate either of two well-known makes of modern non-breakable resistor sections.

A combination radial thrust ball bearing is used on the shaft which carries the contact arm, and graphite bronze bushings are used in the operating pinion and quadrant.

One of the important results of this new development is the production of a face plate controller for low horsepower ratings, having the same general outline as the large size and also using the same effective magnetic blowout feature and the quadrant and pinion method of operation.

A new brake was developed during 1925 and is now being manufactured by The Clark Controller Company, of Cleveland, Ohio. The brake is for use on Electric Cranes, Elevator Motors, Electric Hoists, Motor Driven Screw-downs and similar applications. Can also be operated as a foot-brake.

The general appearance of the brake is shown fairly well by the accompanying cut, Fig 2, from which may be noted the friction band is divided into

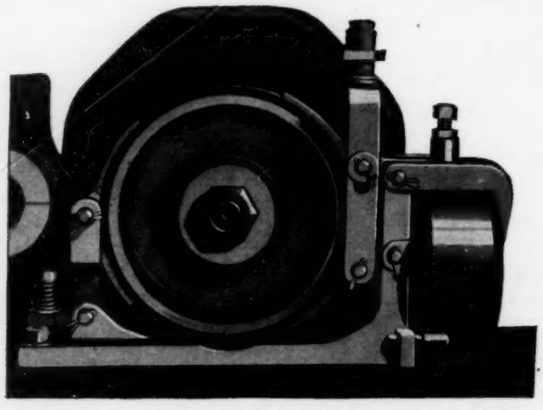


FIG. 2.

two parts. These parts are duplicates. About 89 per cent of the brake wheel surface is utilized. By means of a geared sector arrangement (see Fig. 2) a positive release is obtained by spreading one end of each band while the other end of bands is pulled away from the wheel by the bell crank under spring pressure.

The brake is equally efficient in each direction of rotation of the brake wheel. It takes not more than five minutes to disengage the upper band, throw it back and allow removal of motor armature with brake wheel. In doing this the original adjustment of the brake can be maintained.

The two adjustments, one for the braking torque desired—the other to compensate for wear of brake lining—are very accessible. The same general design is adaptable for alternating current operation and also for use as a foot-operated brake.

RIEHLE COMPANY.

It would seem that the year just past has witnessed a more active and healthy advancement in testing machine design than any other similar period since wooden frames and hydraulic jacks were discarded back in the 70's and the all-metal machine was ushered in.

There is one fact that makes it difficult to mark in a few words a conception of all the changes which this advancement has brought, and it is this: In a period of a year this industry turns out between three and four hundred distinctly different kinds and sizes of machines for the amazing variety of purposes which are presented. About three quarters of this array of machines carry major or minor improvements made during the year. Here is the reason for so much improvement activity. Many of these drawings for special machines have lain uncalled for in the files until some special order or new use brings them to life again. As each design emerges it comes under the scrutiny of an engineering department which is endowed with an instinctive desire to see what it can do to improve an existing device. Very few machines, therefore, which have been in obscurity for more than a year ever escape the process of revision.

Difficult as it may be, therefore, to discuss improvements generally, we can at least point to the three types which have undergone the most unsparing revision.

It is the Universal Testing Machine which dominates the field of testing equipment, and naturally emphasis was placed upon its development. To gain a basis for re-design, the Riehle Co. sounded out test engineers, metallurgists and professors in engineering colleges to obtain a digest of opinions as to improvements which would most appeal to them. These opinions seemed to indicate that a more spacious weighing table was an essential change, as it would, among other things, provide more elbow room for manipulation of specimens and for the use of instruments on the specimens, as well as accommodation for bulkier specimens. This meant increasing the clear distance between the power screws. While this was being done, however, it was discovered that this increased distance opened the way for rearrangement of gearing within the box beneath the weighing table in which could be introduced reversed rotation of the third screw in a three screw type of machine. The advantage in this is the achievement of a perfect neutralization of the forces tending to displace the drawhead in a horizontal plane when the direction of movement of the drawhead is changed from up to down or vice versa.

Preceding this alteration considerable study had been devoted to the relative merits of two, three and four screw testing machines, but the three screw machine was a winner on so many points that concentration was directed upon it.

This re-design, thus begun, presented the opportunity to give the Universal Testing Machine in all its sizes from the 2,000 lb. dwarf to the 1,000,000 lb. giant a complete change of dress and a modernizing from every angle, introducing considerations as to better weight distribution, more graceful lines and an improved finish.

Next in importance among testing machines is the 3,000 Kg. Deadweight Brinell Hardness Testing Machine. The lever weighing type machine has always seemed to embrace so many inherent advantages that the Riehle Company has adhered to the

type to the total exclusion of the hydraulic, even though the lever machine was of greater size and weight, in some instances considered a disadvantage. The steel industry wanted a Brinell Hardness Tester of the lever type that could be carried about in the rolling mills and shops to make hardness tests right on the spot in the mill instead of going to the trouble of taking specimens to the laboratory. The lever machine was preferred because it could withstand any amount of severe treatment without loss of accuracy, because it in no way depended upon oil cylinders which might be effected by temperature extremes, and because it was entirely without delicate hydraulic gauges.

To meet the requirement of minimum size, a design embracing a multiplication of short levers in an ingeniously contracted weighing mechanism was brought out. To gain the needed lightness in weight an aluminum frame was used. This combined light weight and small size produced a truly portable machine. Finally all knife edges were made double (top and bottom) so that the machine might be thrown over on its side without unseating the weighing levers.

A third and very necessary development in testing equipment was the change in the drain tile tester where substitution of the positive lever weighing system was made for the old hydraulic head. Although the drain tile tester is of little interest to the steel industry, nevertheless the case is representative of the tendency of testing machine manufacturers to divorce themselves from dependence upon the delicate and uncertain hydraulic gauge as a means of measuring test loads under all conditions of service. The lever weighing system, with its cast iron levers, steel knife edges, and either a weighing beam or a dial, has proven itself an instrument of sustained accuracy and sensitiveness under all conditions. It was necessary then to design a weighing head with a lever system, which head could be furnished as a unit to fit into those drain tile tester upright metal frames already in service, after removal of the hydraulic weighing head. This objective was happily accomplished, and the substitution was a matter of no great complexity or expense.

It requires constant study and tireless changing of design to keep abreast of the ever-changing specifications and standards of the authoritative associations and societies related to many industries, which organizations make the testing rules. To do this is a large order, but it must always be done, and the confidence of testing engineers is well founded when it anticipates that the testing machine industry will always furnish it with the last word in standard equipment.

ALLIANCE MACHINE CO.

There is now under construction at the Central Furnace Company's plant at Massillon, Ohio, a new yard for storing iron ore and limestone being built in connection with the new blast furnace improvement at that plant. The yard equipment will be a 10-ton Man-trolley bridge and a moveable car dumper, both electrically operated. Both the car dumper and bridge, while constructed along the lines of general practice for yards of this character, have some novel features.

It is well known that where yard conditions will permit the use of a moveable car dumper, such a machine has proven to give the best operating costs for putting ore into storage. This machine has sufficient lifting capacity to dump the ore over a 10-foot wall which forms the side of the ore yard, and deposit the ore, car load at a time, directly into the space allotted for ores of varying analysis, so, for example, if there are separate piles for separate group ores, the ores for each pile are deposited directly into the space allotted and the machine can be moved from pile to pile so as to be opposite any space.

The ore bridge being of such a span that it not only spans the ore yard but also the car dumper as well, can work simultaneously with the car dumper and carry the ore back and fill the yard. The space immediately in front of the car dumper, of course, only has a limited number of car capacity.

The car dumper is being built to unload cars up to 120 tons capacity, providing not only for dumping any present road equipment but giving due allowance for possible future larger and longer cars. This dumper is mounted on trucks at the four corners of the machine and these trucks each carry a motor and are self-contained carriers, and provide the power for moving the machine with or without a car on it and also for dragging along the approach tracks and the runoff tracks which are tapered girders mounted on rollers, riding directly on the rails of the yard track.

The railroad cars are put onto the car dumper machine by pushing them up a short 8 per cent incline by a yard engine. As fast as they are dumped they are pushed on over by the same engine. The track on the far side of the machine being a downward incline, the cars run off by gravity and the loaded car replaces the empty.

The machine has a capacity for turning over as high as 30 cars per hour with an operating force consisting of one operator, and there is generally employed one oiler to keep the machine lubricated as well as, of course, the locomotive crew who bring in and take out the railroad cars.

Dumpers of this character can be counterweighted with heavy weights, which operate in guides on the back side of the machine so that the motor equipment has to lift only the weight of the car and contents and not the rotating frame of the machine. Further, one side of the frame of the machine being pivoted, the actual rope pull on the drums is only about one-half of the weight of the cars and contents. The cars are held clamped in the rotating cradle also by counterweights running in similar guides at the rear and this clamping mechanism is entirely automatic, releasing itself as the car returns to its upright position. The machine turns the cars almost completely over, being only 20 degrees of upside down so that all of the contents runs out freely.

The machinery for operating this equipment, of course, is heavy and in this case considerable has been done in the way of increased efficiency. The machinery is mounted on top of the moving frame so that the ropes lead directly from the drum to the

lifting cradle without passing over guide sheaves. The motors are built special with heavy roller bearings and the motor gears are cut herringbone. The general construction of the machine is shown on drawing 31328 herewith.

The ore bridge will be one of the large ones in this district having a center span of 340′, an overall of about 470′, providing very liberal ore storage space, as well as passing over and beyond the car dumper. It is being built of the inverted tower and shear leg type with swivel construction at the tower and with the bridge suspended at the shear leg in flexible links so that it is possible to skew the bridge diagonally across the yard when desired.

The truss will be a rectangular sub-divided panel construction with the track stringers suspended below the floor beams. The cantilever at the tower end of the bridge spans over the bins and transfer car tracks in the usual manner. There is also a short cantilever at the opposite end in case of special reshipment of material.

On account of the natural lay of the ground at Massillon, the ore bin system is built into a side hill so that the connection between the high level tracks and the yard tracks are easy grades. The contour of the land is admirably adapted to a blast furnace layout.

There has been such a large wind loss of ore yard bridges in the last 10 or 12 years, in fact the percentage of bridges lost is a very serious matter, so that in the construction of this one, every attempt has been made to protect it against this risk. The bridge is to be moved longitudinally by the so-called "Fickinger Rack Drive," a plan originated by P. J. Fickinger, deceased, formerly chief engineer of the Steel Corporation Dock at Conneaut. It consists of a heavy rack built along the top of the concrete runways and securely anchored into it at 37′6″ spaces, the rack itself being proportioned to take any possible wind load.

The wheel base of the bridge, longitudinal of the runways, is proportioned so that it is not deemed possible for any wind to tip the bridge over while it is locked. The bridge is then made fast to the rack by large gear wheels (the so-called "Bull Wheel") which is rigidly attached to the bottom of the sills of the bridge and always in mesh with the rack. Then by suitable reduction spur gearing, and at the last a worm gear reduction, it is connected to the motor. The angular pitch of the worm gear is such that with the armature of the motor at rest, it will be self-locking so that as long as the mechanism remains intact, the bridge is automatically locked to the runway and would only move upon applying power to the motor.

There are certain mechanical features in the way of preventing too sudden stooping and smooth acceleration in starting, the speed of the bridge along its runways is very moderate, approximately 50 ft. per minute.

Each end of the bridge has a separate driving unit and of course a separate rack and there are positive skew limits to control the over travel of one end of the bridge ahead or behind the other.

This plan of operation is not entirely new, having been used at Conneaut, Ashtabula and Toledo, on similar structures.

There is a new feature in applying roller bearings to all the motors on the bridge, as well as to the trolley bearings throughout. It is, of course, realized that the conditions for roller bearings are quite severe, and it will be interesting to observe the severe tests on the roller bearings which this equipment will make. There is no doubt as to the desirability of the high efficiency of roller bearings in this service, but owing to the fact that these roller bearings are as yet an untried feature, the design of the trolley is such that straight bearings may be readily substituted, if desired.

The bucket will have a capacity of 160 cu. ft., 10-ton iron ore and 7½ tons of limestone. It will be similar to the "Hulett" type bucket and constructed using a considerable amount of Central Steel Company's alloy steel. The general arrangement of the ore bridge is shown on drawing 29860, herewith.

Both the ore bridge and car dumper are being constructed by The Alliance Machine Company, Alliance, Ohio.

HYATT ROLLER BEARING CO.

Analysis of heavy duty electric motor troubles in steel mills has shown that a large percentage of failures may be directly traced to bearings.

Severe service conditions imposed upon mill and crane type motors cause ordinary bearings to wear rapidly, bringing on a multitude of troubles.

Armatures rub on pole pieces, causing shorts, and oil passes along the shaft, soaking into insulation, which results in burned out coils.

Motors with ordinary bearings, which run three shifts during periods of peak production, require constant oiling. Even with the best of attention, they must be shopped at frequent intervals.

Because of this, electrical superintendents in many large mills are installing roller bearings in their motors, and as records for economy and dependability mount, the long-sought end of motor bearing troubles seems in sight.

A splendid example of anti-friction bearing efficiency is reported by a steel mill which changed over in its own electrical department a 50 H.P. motor from brass to roller bearings.

This motor was returned to service on a blooming mill screw down, where brass bearings consistently failed to stand the gaff. The bearings were packed with a soft grease and the motor allowed to operate three months without attention. Inspection at the end of that period showed that the bearings were perfectly lubricated and the insulation absolutely free from grease.

Hyatt bearings may be easily applied to existing motors, or ordered direct from manufacturers on new equipment. They are furnished complete with specially designed, oil-tight housings, or end bells, which exactly replace brass bearings. On some types of motors slight changes are necessitated, which may be readily taken care of by the ordinary electrical repair department.

The chief characteristics of our bearings are the helically wound, hardened and ground rollers, which operate between hardened and ground race-

ways, one pressed on the armature shaft, the other retained in the housing.

Rollers are extremely sturdy, so that under no circumstances, can the shaft wear through them to the housing, and they are resilient enough to deflect under severe stress which would snap shafts and ruin an ordinary bearing.

This construction results in long life, positive lubrication, and free rolling motion between housings and shaft, thus making our bearings ideal for electric motor service.

For many years, ingot and charging cars, cranes, conveyors, roller tables and other steel mill machinery, Hyatt equipped, has been rolling up records for carefree operation, low maintenance costs and long life.

ERIE MALLEABLE IRON COMPANY

The development of a new type of threadless conduit fittings marks the beginning of a new era in the electrical contracting industry. There has been a steady increase in conduit installation costs since conduit was first used, and, until today, practically no advances have been made in simplifying and reducing the cost of such construction. This desirable and indeed necessary result is accomplished by a new line of conduit fittings now coming onto the market. This new fitting is known as the Emico Kondu-Box, manufactured and marketed by the Erie Malleable Iron Company of Erie, Pa., who have been widely and favorably known since 1880 as manufacturers of malleable iron castings of the highest quality.

The major portion of the expense of conduit construction is made up of the cost of cutting the threads on the conduit and then screwing the con-

FIG. 1.

FIG. 2.

FIG. 3.

duit into place. The Kondu-Box does not require any threads on the conduit, although it will grip either threaded or unthreaded sections securely; the cost of thread cutting is thus entirely eliminated, while the cost of erecting or putting the conduit into place is reduced to a minimum, owing to the fact that it is unnecessary to screw the conduit into the fitting.

The Kondu-Box is so designed that every connection or outlet is a union in itself, which eliminates the use of running threads or unions, but permits construction to be started at any point, without resorting to the objectionable running thread. Use of the Kondu-Box also eliminates such troubles and hazards as broken castings which, where threaded fittings are used, are often caused by fording the tapered thread on the conduit into the fitting and cracking the box. The wedging action of conduit in threaded fittings leaves the fitting always under tensional stress, so that excessive vibration causes crystallization of the cast iron, cracking the fitting and rendering it useless.

When threads are cut on conduit and the conduit screwed into fittings, there is always one, or even two or three, threads left exposed to the action of the weather, which is frequently the cause of weakening in the ordinary conduit installations. The Kondu-Box is made of certified malleable iron, which is practically unbreakable and a bushing and lock nut are used to hold the conduit in position. The Kondu-Box is not under direct tensional stress but instead, a combination of tension and compression. The conduit is not weakened by cutting away more than one-half of its area to get a good thread, leaving exposed threads to rust or corrode as is the case in threaded-conduit practice, but, on the contrary, it is actually strengthened by the reinforcing action of the bushing and box.

A perfect running ground is secured by means of ridges or ground rings on the interior of the bushing, which are forced through the enamel on the conduit as the lock nut is tightened on the bushing.

The bushing is case-hardened, so as to insure the ground ring cutting into the conduit, as well as to aid in gripping the conduit. It is practically impossible for the joints to become loosened by vibration, the spring action of the bushing and the slot in the bushing forming a lock which prevents such loosening. The bushing is so constructed that it has a parallel grip on the conduit, due to having a tapered thread for the lock nut, as well as a taper on the interior of the box, in which it seats. The bushing is made with a machined bead against which the conduit seats, which insures a perfect surface with no flaws, sand holes, sharp corners or ridges to cut the insulation when pulling cables or wires.

It is often necessary that fittings be changed in an installation after it has been completed; namely, a T or an X substitute for a straight pull box or L. To accomplish this with threaded fittings it is necessary that the fitting be broken out of the line or that the conduit installation be torn down from the start, or that the conduit be cut on each side of the fitting and the fitting removed. With the Kondu-Box one fitting may be replaced by another by simply unscrewing the lock nut and slipping the bushings inside the box, after which the box may be removed from the line and the desired type substituted, without the necessity of cutting the conduit or the use of running threads or disturbing the balance of the installation.

The opening of the Kondu-Box is such as to provide maximum accessibility to its interior, while the cover screw lugs are so placed that it is impossible to have a ground or short circuit due to screwing the cover screws into the wiring.

It is possible when using the Kondu-Box to eliminate a large quantity of right and left-hand L's, which would be required normally with the screw type fitting, because with Kondu-Box any kind of bends may be made in the conduit and the conduit clamped in place in the fitting without the necessity of turning the conduit. Approximately one turn of the lock nut is required to lock the conduit securely in position. This results in a very large saving in the labor charges of the average conduit installation.

It is impossible to lose the cover screws out of either the metal or porcelain covers that are provided with Kondu-Boxes. In the case of the metal cover, the screw is retained in its proper position by a very ingenious method which consists of dishing the cover around the screw hole, after it is punched for the screws and the use of a rolled thread machine screw whose shank is smaller than the outside diameter of the threads. The screw is placed in the screw hole and the metal swedged around the screw. The swedging operation contracts the hole to a diameter smaller than the outside diameter of the threads and slightly greater than that of the shank, thus securing the screw perfectly, yet permitting it to turn freely.

The porcelain cover has the screws retained by means of a fibre washer, which is forced into a countersunk screw hole in the cover. This method not only provides for the retaining of the screws, but gives a perfect cushion under the screw head which prevents the breakage of covers from excessive tightening.

There is a complete line of threadless couplings as well as adapters for use with standard steel knock-out boxes, thus making it possible to make a complete conduit installation with no other tools than the wrench, which is furnished with each shipment of fittings, a hack-saw and a reamer. These fittings operate on the same principle as outlined above.

There has also been developed an adapter bushing which permits the use of Kondu-Box fittings on flexible conductors installations or the coupling of the flexible conductor to any threadless fitting without the use of unsightly clamps or with screws or the cutting of threads on special adapters. This device is simply a beaded bushing which is inserted over the flexible conductors and seats in the bushing proper of the Kondu-Box and the gripping action is exactly the same as that on standard conduit.

The use of the Kondu-Box makes it possible to cut conduit to drawing dimensions without making measurements, as the work is being done so that the fittings will come on the centers, as shown on the drawings. This is made possible by the fact that there is no such large variation in the making of a joint with Kondu-Boxes, such as occurs when the tapered thread is screwed into the fitting.

Several users of Kondu-Box fittings, after definite study of their conduit problems, have stated that more than 50% of the time normally required in conduit construction with threaded fittings is saved where the threadless Kondu-Box fittings are used.

ELECTRIC SERVICE SUPPLIES COMPANY

Keeping pace with the times and in stride with the industry and anticipating the future has meant certain notable additions and improvements to the Electric Service Supplies Company's products during 1925.

Rated on a par, and if not exceeding in importance the natural development or actual new additions to the line, is the increase in knowledge of the engineering, sales and manufacturing staffs of the company. Here we have had great development. Constant and broad research has added greatly to our fund of knowledge, so that our personnel is still better equipped to render service.

The increasing application of floodlights to industrial lighting has brought forth new lighting units and continued study of the problem has brought forth new ideas and methods of floodlighting. One of the new units is a projector with a cast aluminum alloy case approximately 3/16 inch thick, equipped with a hinged door of the same material, and in which a 14-inch Golden Glow and Crystal mirror glass reflector which is mounted, thus affording easy access to the reflector for inspection or cleaning, without disturbing the lamp bulb or its focus. The focusing device is located on the outside.

A new machine for winding and spreading armature and stator coils, which incorporates all of the advantages of the original and most popular machine of this kind—together with certain time-saving and scientific improvements, has been put upon the market.

A machine accurately and sturdily made; completely self-contained; easily and quickly adjusted to a wide range of coils which will produce after setting coils perfectly formed, and each one identical with the other.

Armature repairs, including coil making, under your own suprevision and control, is now still more feasible and practical.

For many years the Peerless Universal Armature machine has been an indispensable tool in the repair shops of the country's largest industrial plants.

The increasing size and weight of armature made it necessary, and our research department made possible, the development of the new Universal machine. Built with a cast iron bed, accurately and carefully machined like a standard engine lathe, with radical improvements in the various devices incorporated in the machine, that is the banding attachment and tension device, slotting attachment, grinding wheel and truing tool, has made it a very worthwhile piece of armature repair equipment.

More and more is the necessity of baking armatures being proven. Economy and continuity of service demand it.

There have been recent developments in the way of construction and erection that will mean great economies in first costs and erection and also insure a perfect operating oven.

Hereafter we will sell the metal work, heat regulating equipment, automatic or otherwise, ventilating system and the design, furnish erection data and specifications for insulation which customer buys locally at a considerable saving.

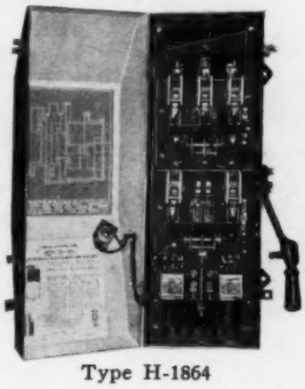
The improvement here is that while formerly we sold a complete oven with insulation, we are able by this new plan to permit the user to purchase their own insulation, thus saving them considerable.

We took pardonable pride in our display at the recent Iron and Steel Convention at the Commercial Museum in Philadelphia. All of the new equipment, described above, was on display, together with an extensive line of other equipment.

ALLEN-BRADLEY COMPANY

The Allen-Bradley Company of Milwaukee, have, during the past year, in addition to their continual development work on already existing lines of motor control apparatus, brought out several new types of motor starters.

One of the most important of the new starters is a slip ring motor starter known as the Type H-1864.



Type H-1864

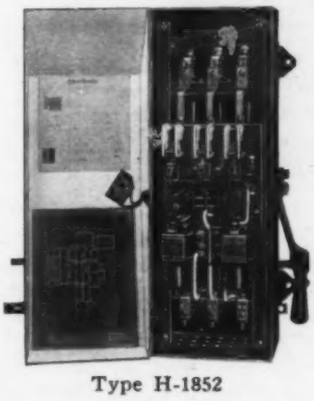
This starter provides control of both stator and rotor circuits with one operating handle. All switching of both stator and rotor circuits is performed by magnetic contactors. The starter is so arranged that lifting the operating handle mechanically closes a pilot contact which causes the upper magnetic contactor to close and connect the stator to the line. Three units (graphite disc compression resistors) connected permanently in the rotor circuit are compressed as the handle is lifted and gradually bring the motor up to speed, after which the lower magnetic switch closes and short circuits the resistors. The resistors being of the compression type give a smooth, stepless range of resistance from extremely high at the instant of connecting the stator to the line to a very low resistance at the instant of short circuiting. The stepless variation of resistance also insures pasing through the exact resistance value that will give maximum starting torque when starting very heavy loads. The overload relays are in circuit during starting, as well as running and since the contactors are magnetically-operated, they are "trip-free" of the starting handle and prevent the operator from lifting the handle up too rapidly during starting. A "stop" button in the front of the enclosing cabinet provides for convenient stopping. After the "stop" button has been pressed, overload relays tripped or failure of line voltage, the complete starting cycle must be repeated to bring the motor up to speed, it being impossible to start without having the maximum starting resistance in the rotor circuit.

The H-1864 is available for motors up to 60 h.p, 220 volts, 100 h.p., 440 or 550 volts. For larger sizes, a floor mounting type is used known as the H-2064.

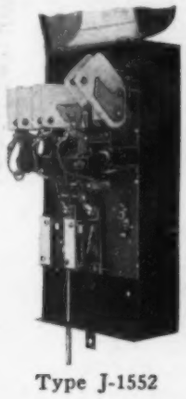
For squirrel-cage motors the existing H-1852 of primary resistance starters using Bradleyunit resistors, has been increased by the development of a starter for 100 h.p., at 220, 440 or 550 volts. It was found that squirrel-cage motors up to 300 h.p. could be started with these starters without exceeding the starting current limits established by the large power companies where the load to be started was simply an inerta load such as centrifugal pumps, blowers, fans, turbo-compressors, motor-generator sets, etc. The initial current inrush could be held to 150 or 200 per cent of full load running current and this did not cause undue disturbance to the power companies' lines. Several installations of 100, 150 and 200 h.p. squirrel-cage motors have been installed in the large cities, power companies having given their consent upon guarantee that their current limitations should not be exceeded. This has made possible several direct connected 3600 R.P.M. installations that otherwise would have been impractical. Up to and including 100 h.p. wall mounting starters are used. Larger sizes use the floor mounting construction. It is expected that this development will open up a large field for squirrel-cage motors in the larger sizes.

Another new development in the alternating current line is the Type J-1552 Forms R and RM, Automatic Reversing Switch. This reversing switch consists of two interlocked magnetic contactors mounted one above the other on an angle iron frame in a steel cabinet either with or without overload relays. The switches are equipped with double arc shields and magnetic blowouts to insure unfailing reliability on plugging service.

For service in very wet or very dusty places, the Type J-1552 across-the-line motor starting switches for squirrel-cage motors up to 10 h.p., are now available in heavy cast iron watertight enclosures. The across-the-line starters also have been increased in ratings to 150 amperes, so that motors of the automatic start type or the new double squirrel-cage motors up to 50 h.p. may be thrown directly on the line.



Type H-1852



Type J-1552

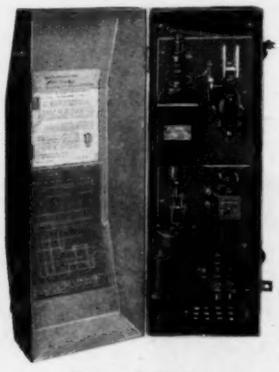
The Type J-1552 starting switch line has also been augmented by a line similar in construction, but using thermal relays. This line is known as the J-1552 Form T to distinguish it from the older line using magnetic relays which is now known as the J-1552 Form M.

In the direct current field, an automatic time-limit starter known as the Type C-1310 has been brought out. This starter has, as a distinguished feature, the provision that the entire switching duty is performed by one single-pole magnetic contactor protected by arc chutes and magnetic blowouts. This is possible through the use of the Bradleyunit resistor which, by its nature, does not require switching of any form to lower its resistance dur-

ing the starting cycle. The starter, therefore, consists only of a single-pole contactor to open and close the line current, a graphite disc resistor, a solenoid for compressing the resistor, and a dashpot to give the time limit action in accelerating the motor. After the solenoid has compressed the resistor, a large graphite contact operated by the plunger of the solenoid, short circuits the resistor entirely out of the circuit.

The initial current inrush is very low, amounting to only about 50% of full load running current. This insures that the starting current taken will be no greater than is actually required even at light loads. The time of acceleration may be conveniently adjusted by a small screw by-pass in the dashpot. Overload relays are an optional feature. The small amount of switching and the simplicity of construction make this starter require extremely little maintenance.

This starter is also available in the current limit type known as the Type C-1220. It is identical in construction to the C-1310, except that a vibrating relay controls the rate of acceleration instead of a dashpot.



Type C-1310

The Type F Crane, Mill and Hoist Controllers have been further improved by using magnetic contactors to perform all switching duty. The contactors are controlled by a small drum switch in the base of the controller-operated by the control lever. Only two pole contactors are used for the A. C. controllers, one being for "Forward" and the other for "Reverse" operation. The resistance control is accomplished entirely by compression of the Bradleyunit resistors. This construction has eliminated the multiplicity of switching contacts and fingers which are inherently the most troublesome parts of electrical control apparatus.

Last, but not least, the entire line of motor starters has been worked out, so that the starting mechanism is assembled on an angle iron frame and can be lifted out of its cabinet as a unit by simply removing four screws. This greatly facilitates such inspection and replacements as are necessary.

FARREL FOUNDRY & MACHINE CO.

The Farrel Foundry and Machine Company, Buffalo, N. Y., have developed during the past year a two-speed, gear drive for rolling mills.

The illustration shows one of these drives which is being supplied to the Latrobe Steel Company. It is designed to transmit 500 H.P. with motor speed of 860 R.P.M. and to give a high speed of 275 R.P.M. to the mill and a low speed of 165 R.P.M. It is in use on a 10" bar mill, used for rolling high-speed tool steel. The desirability of a variable speed drive for a bar mill is well understood, and it is relatively common to employ for this purpose a variable speed motor. Such motors, with the necessary control apparatus, are expensive. The new gear drive allows the use of a standard motor, which

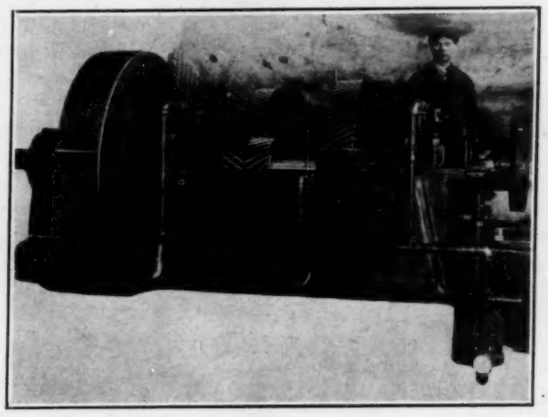


FIG. 1.

can run at a relatively high speed. The flywheel on the pinion or motor shaft can be designed for the high speed of the motor instead of for the low speed, as is necessary when a variable speed motor is used. This saves expense and results in better operating conditions, because the flywheel is always working at maximum speed and, therefore, it is always capable of storing or giving out the maximum amount of energy in proportion to its weight.

Two-speed gear drives have been proposed or used, in which it is necessary to change the pinion when changing speed. This makes a very awkward arrangement and necessitates quite a lengthy shutdown when changing speed.

The drive developed by this company and shown in the illustration, comprises one complete self-contained unit. The two pinions are integral with the flywheel shaft. Each drives a wheel mounted on the shaft coupled to the mill. Each of these wheels is bushed and can rotate independently on the shaft The driving connection is made by means of a gear-tooth clutch, which is placed between the two wheels and is mounted on the low-speed shaft. This clutch member engages with teeth cut in the hubs of the wheels. It is mounted slideably on its shaft, which it drives by splines cut integral in the shaft. It is operated by a lever placed outside the gear case. This lever is conveniently placed and the change of speed can be made instantly by simply pulling over the lever; only one wheel can be engaged with the shaft at once, so there is no danger of both gears being in driving connection at the same time.

Forced lubrication is provided throughout. The pump for the lubricant is driven from the high-speed shaft of the gear unit. All the bearings are supplied with oil under pressure and the gear teeth are lubricated by means of sprays from the same oiling system. Therefore, the gears do not churn oil, and in

this way the maximum mechanical efficiency is obtained.

The second unit of the same design is at present being installed at the Latrobe Electric Steel Company's plant. It is believed that this type of two-speed drive can be advantageously applied to a great number of mills. It appears to have the advantages of reliability, simplicity and low first cost. It provides a large range of ratios. That is to say—al-

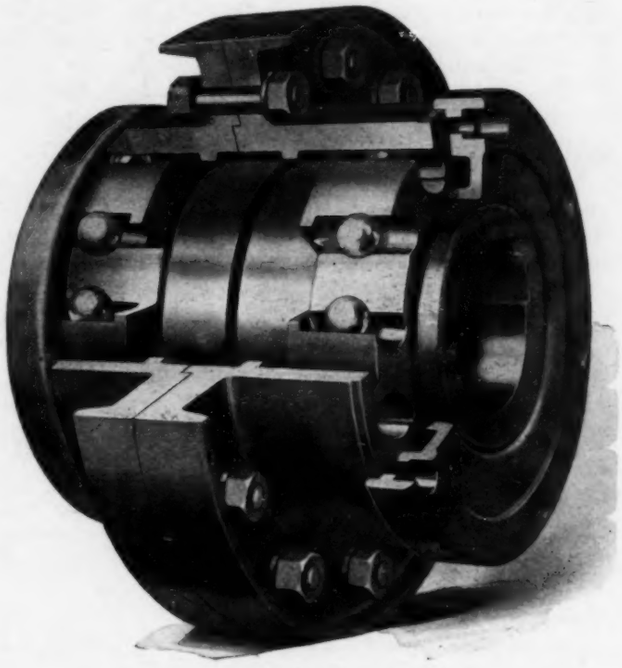


FIG. 2.

most any standard speed motor can be used and any two convenient low speeds can be adopted to suit individual conditions.

The provision made for ample lubrication is especially noteworthy. This system provides positive lubrication to every moving part, including the bushes in the bores of the wheels. These bushes are lubricated through the low speed shaft, which is made hollow. The sliding clutch is also lubricated in the same way. A thrust collar is provided on the low speed shaft to take the thrust of the wobblers. This is also forced lubricated. A larger strainer is provided in the lubricating system and this strainer can be cleaned when the drive is in operation. The drive illustrated is connected to the motor by means of a Sykes universal flexible coupling, made by the Farrel Foundry and Machine Company.

THE PACKARD ELECTRIC CO.

The new developments of The Packard Electric Company during the year just ended were almost all in the nature of refinements in construction rather than in radical developments or departures from previous methods. However, the progress made during the year in developmental work was very considerable and contribute considerably to the work of keeping transformers operating and holding the voltage up where it should be.

The Packard Electric Company in 1925 developed and perfected a method of mounting sectionalized coils for high voltage industrial power transformers, which is of special interest to the Iron and Steel Electrical Engineer. Describing this method of mounting briefly, the low voltage winding is wound as usual next to the core—the high voltage winding is wound in sections, each section being wrapped and built up separately. Before the assembly of high voltage coils a heavy, thick cellulak composition insulating tube is slipped down over the low voltage windings and firmly clamped into place. The high voltage coils are then slipped on, which provides a construction such that, in case of trouble, can be removed and replaced. This construction, which is being used by this company in high voltage transformers, should have particular interest for the steel man.

The externally operated tap changer, which was perfected by this company in 1925, is second to none and is, to say the least, a very ingenious and rugged piece of electrical equipment. The tap changer is likewise constructed by using the Cellulak tube method of mounting. The connection contacts and switch plates are very rugged, but so mounted that they can be easily changed by means of a large conveniently located handle projecting through a water tight arrangement in the cover and plainly marked so as to prevent any mistake in tapping out the voltage. It is also entirely fool-proof so as to prevent any damage due to its operation by an inexperienced operator. The windings cannot be damaged, regardless as to how the handle is turned This tap changer can be used to bring the secondary voltage back up to normal voltage on power units, even though the primary voltage may drop even 10%. It helps to compensate for regulations in the transformer and will maintain at the secondary terminals of our Power Transformers normal voltage required for steel operation.

The developments during 1925 also include great progress in the construction of our combined potential and current metering transformers. The line from 13,200 volts to 66,000 volts, inclusive, has been changed to the cover-suspended type, so that the complete element is lifted with the cover.

New equipment has been installed and testing facilities very much improved in the Packard plant. From the little Packard Sport Model distribution transformer up to the 3000 KVA, 3 phase power unit, our manufacturing processes have been improved.

ALLIS-CHALMERS MFG. CO.

Steam Engines

No radical changes have occurred in the steam engine field during the year 1925.

During the year we built and put in operation one of the largest Corliss Engines ever built, this being a 44 & 84 x 66 Twin Tandem Engine for the American Steel & Wire Company's plant, at Donora, Pa.

This engine has a normal load of from 8,000 to 10,000 I.H.P. and is capable of carrying maximum loads up to 18,000 I.H.P.

Steam pressures and temperatures are continuing to rise and we are building an increasing number of

drop piston valve engines to meet these conditions. In many installations comparatively high back pressures are employed (running up to 100 lbs.) and for these conditions the drop piston valve engine is perfectly suited, as the valves are balanced and operate noiselessly under all pressure and load conditions. For ordinary steam pressures and temperatures, however, the standard Corliss Engine still holds the lead and will give as good economy as any type of engine operating under similar conditions.

During the year we have built a number of steam driven air compressors of large sizes, and it is significant to note that these orders have nearly all been from customers who have used our compressors for many years.

Condensers

During the year we have built the usual number of both surface and jet condensers, but have made no important changes in design, but have improved such details as the submerged hotwell, etc.

Early in the year we put in service the 52,000 sq. ft. condenser in the Waukegan plant of the Public Service Company of Northern Illinois—Chicago Edison interests.

This condenser is operating with our 35,000 K.W. turbine and has performed perfectly from the start, the vacuum obtained being from .3" to .5" better than our guarantees.

We are now constructing a larger condenser of the same general design for our 50,000 K.W. turbine, which is to be installed in the same plant.

On jet condensers no changes in design have been made.

Gas Engines

During the year we placed in operation another 48x60 Twin Tandem Gas Engine, this being the seventh of that size built by us. These engines normally carry a load of about 3600 K.W. and continuous overloads up to 4000 and peak loads of 4200 K.W. or above for short periods.

We have applied our later type of valve gear to a number of our older gas engines and by so doing have increased the capacities from 10% to 20%.

We have furnished a large number of air cylinders of our automatic plate valve type to replace the same number of "Slick" cylinders, which were originally installed on these gas blowing engines about fifteen years ago. With our plate valves it is possible to increase the capacity of the engines by speeding up and the cost of lubrication, maintenance and repairs is very much reduced.

Oil Engines

We recently received an order from the Ozark Pipe Line Corporation for twenty-five (25)—270 H. P. Oil Engines for pipe line pumping.

These engines have three 16x24 cylinders and operate at 210-225 R.P.M., each engine driving through gearing, one 14,000-barrel Allis-Chalmers pump, operating against 800 to 1000 lbs. pressure.

These pumps are also duplicates of others furnished to the same customer.

Turbo Alternators

We are now building a 50,000 K.W., 1800 R.P.M Turbo Alternator for the Waukegan Generating Co. This is a considerable increase in size over any machines of this type that we have built before, and its electrical and mechanical design presents many problems, the successful solution of which will be an achievement. This goes in the same plant as the 25000 K.W. and 35000 K.W. units previously furnished.

Waterwheel Alternators

Progress in the hydro-electric field in 1925 is best shown by the successful design installation and operation of several automatically operated plants. We have installed five plants located in the Middle West, which are remote controlled and are now building two others.

Synchronous Motors

We have received various orders during the past year for synchronous motors with novel features. Notably a 2500 H.P., 257 R.P.M. motor for steel tube mill drive. Also, two 600 H.P., 100 R.P.M. motors for driving rubber mills. These latter motors are specified to run for several minutes without excitation, developing full torque under this condition

Direct Current Generators and Motors

Further development of the "Frog Leg" winding has resulted in our obtaining orders for some large, direct-current motors, including a 4500 H.P. and also a 7000 H.P. motor for reversing blooming mill drive. We are also making seven 1000 K.W., one 1500 K.W. and one 2000 K.W., 600 volt rotary converters, which will be equipped with "Frog Leg" windings.

Synchronous Condensers

We have received orders this year for several synchronous condensers 3000, 5000, 10000 and 15000 KV-A. These are all sizes that have been developed and these orders emphasize the satisfactory operation of these machines.

Diesel Engine Drive Alternators

Along with various orders for small and medium sizes of alternators for Diesel engine drive we are making three 3125 KV-A Alternators for the Panama Canal. These alternators will be driven by Nordberg Diesel Engines and are intended for standby power supply for the Canal Zone.

Motor Generators

To supply current for the large direct current steel mill motors we have built or are building some large motor generator sets, including a 6000 K.W. three-machine set and several 2000 K.W. three-machine sets. These are all equipped with "Frog Leg" windings on the direct current generators and have new 25 cycle motors, some synchronous motors and some induction type. We have also just received an order for a 7000 KV-A 25 to 60 cycle frequency changer set, which will be used to tie together systems in Arizona.

Allis-Chalmers Reyrolle Metal Clad Switchgear

After a most careful investigation, extending over a period of nearly two years, Allis-Chalmers Manufacturing Co. is taking up the manufacture of metal-clad switchgear. An agreement has been made with A. Reyrolle & Co., Limited, Hebburn-on-Tyne, England, who are responsible for the development and success of this type of switchgear in Great Britain

and on the Continent, whereby the exclusive rights to manufacture and sell their product in the United States and possessions, Cuba and Mexico have been obtained. Under this agreement designs, drawings, technical data, engineering and manufacturing experience, together with the assistance of experts from the works of A. Reyrolle & Co., Ltd., are available.

The largest and most important of British power stations have adopted Reyrolle switchgear and are fast displacing other types with it. The new Barking Station in London, the last word in power station construction in England, officially opened by His Majesty, King George V, on May 26, 1925, is equipped throughout with Reyrolle metal-clad switchgear. Substantial orders for this new type of switchgear have recently been booked, among which are units of the maximum size.

Transformers

During the past year the Allis-Chalmers Company has built many large transformers, but we are mentioning below only those which are of a special interest or which have some novel features.

We furnished 1—5000 KV-A., 11000 volt, 3 phase self-cooled transformer, which was novel in that it was provided with industrial type housings; that is, there were no exposed bushings, the leads from the transformer being arranged for conduit wiring.

We furnished 2—18750 KV-A, 36300 volt, 3 phase, self-cooled transformers. These are notable for their size.

We have on order 3—15000 KV-A, 132,000 volt, self-cooled transformers.

3—350 KV-A, 600,000 volt testing transformers.

1—30,000 KV-A, 120,000 volt, 3 phase, water-cooled transformer, which is novel in that the core is on wheels and will be rolled out of the side of the transformer instead of being lifted out from the top of the tank.

We have developed a new type temperature equipment so that temperature of both oil and copper can be indicated or recorded at the switchboard, which may be located 1000 feet from the transformer.

We are now using on all transformers our new type space sticks which give improved oil circulation.

Timken Tapered, Roller Bearing Motors

One of the outstanding features in the year's progress is the development and placing on the market of a complete line of anti-friction bearing, induction motors.

Through consideration of the varied applications of our motors resulted in the selection of Tapered Roller Bearings, which were incorporated in the design of Types "AR" and "ARY" motors, all ratings. These motors have received the indorsement of a large number of purchasers in various industries.

Hundreds of these roller bearing motors are in service in all classes of installations in various industries and their operation has been practically 100% per cent perfect.

A new application of our "AR" motor, made possible by Timken bearings, is that of buffing and polishing. Buffer is mounted on the end of extended motor shaft. Some of these motors are used polishing hollow silverware.

Type "AR" Rotor Construction

In the development of the Type "AR" induction motor, silver brazing process was employed for uniting the ends of the rotor bars to the end rings in all except the three smaller frames. To make the line uniform we have changed specifications on rotors of the three smaller frames to call for silver brazed joints. The manufacture of squirrel cage rotors in any construction other than the silver brazed type has been discontinued some time since

Motors for Across-The-Line Starting

The use of squirrel cage induction motors for across-the-line starting is rapidly increasing. We are now prepared to furnish motors of all ratings for this service. In the smaller ratings, motors of standard design are suitable for across-the-line starting. In larger rating special modifications of standard design are necessary. Motors we have furnished for such installations in ratings, including 200 H.P., have proven entirely successful.

Elevator Motors

Engineering refinements in elevator motors, both A.C. and D.C., have removed minor imperfections. Development covers a complete line of motors for both passenger and freight service: A.C., squirrel cage, single speed and multiple speed; D.C., constant and variable speed; also multiple voltage. D.C. traction type equipment is built at Milwaukee.

Vertical Motors

Development is completed for all ratings of vertical motors and parts are carried in stock which permits of the offering of these motors for short shipment.

Potential Starters

Complete equipment for conduit connections was provided for use in conjunction with Type "R" potential starters. These conditions consist of connection box mounted on back of starter and enclosed disconnect switch for mounting on top of connection box. The connection box is a part of regular equipment.

Review of Steam Turbine Work for 1925

In the December number of the Sales Bulletin for 1924, information was given in connection with the first 25,000 K.W. turbine at Waukegan and showing, in part, the operating record of this unit from October, 1923, to October, 1924. The operation of the unit during the year 1925 has been equally satisfactory.

The 35,000 K.W. machine for this same station was placed in service on April 8, 1925, and started its first period of continuous operation on April 13, 1925.

It is interesting to note that the order for the 35,000 K.W. unit was placed before the 25,000 K.W., unit had been in operation for any considerable period.

In July of this year, contract was awarded the Allis-Chalmers Manufacturing Company for a 50,000 K.W. unit to be added to the Waukegan station.

This unit will be a two cylinder tandem compound single generator unit to operate with 600 lb. steam pressure, 725 deg. F. steam temperature and 29" vacuum and the design has been practically completed and construction is under way.

The two 20,000 K.W. units sold to the Illinois Electric Power Company at Peoria, were installed in 1925 and their operating record from the beginning has been eminently satisfactory.

The 15,000 K.W. unit for the City of Lansing, which was the first unit of this size built by this company, was installed in 1924. During the year 1925 we have installed and placed in operation additional 15,000 K.W. units for City of Cleveland, Ohio, and the Staten Island Edison Corporation and two additional 15,000's are now being installed for the Illinois Steel Company at Gary, Indiana.

The Texrope drive has been developed for short center drives of all kinds from fractional to several hundred horsepower. It consists of two grooved sheaves and a number of specially constructed "V" belts. Its qualities are remarkable, being flexible, positive, silent, clean and shock-absorbing, with no slip and no tight belts.

WESTINGHOUS ELECTRIC & MFG. CO.

Turbine Generators

The strides made during the past year in the design and construction of generating equipment have kept pace with the demands of the rapidly expanding central station industry.

Work is well under way on the construction of an 80,000 kilowatt, cross-compound generating unit which is the largest that has ever been built. Each generator is rated at 40,000 kilowatts, 1800 rpm., and the set will be operated in all respects as a single machine.

Work is progressing rapidly on the design of a 62,500 kv-a., 1800 rpm. generator, which is the largest single unit machine at this speed ever undertaken by the company.

The machine mentioned in the preceding paragraph follows closely on the installation of the first 43,750 kv-a., 1800 rpm. generator which, at the present time is the largest machine of this speed in operation. The generator is cooled by fans on the shaft in the same manner as on smaller units. Preliminary tests show that the temperature rise on the stator is less than 60° Centigrade.

Experimental work is being carried on towards the improvement of the insulation for turbo generators. Micarta channels for the end turns and a micarta lining for the retaining rings have been successfully developed. A life test has been run on a model to show the effects of expansion and contraction of the coils on this material. Twelve hundred complete cycles of heating and cooling have been carried out, which is approximately equivalent to 20 years' service on the basis that the units would be started up and shut down once a week. No apparent wear of the insulating material has been found as a result of this cycle test.

A 40,000 kv-a, 600 rpm., multiple voltage generator has been built and placed in service during the year at the East Pittsburgh Works of the company for the purpose of increasing the facilities for testing circuit breakers, switches and rotating machines. Having these machines available, more extensive shop tests can be given customers' apparatus and important experimental work can be undertaken insuring to an even greater extent than ever before satisfactory operation of apparatus upon its delivery to our customers.

The company has also installed at their Sharon works a 10,000 kv-a., 720 rpm., single phase generator set, which is unique in that the generator stator is spring supported in order to eliminate the effect of single phase torque pulsations and their resultant detrimental vibration from being transmitted to foundations and the buildings.

Studies of ventilation of turbo generators by means of small models have been brought to a very successful conclusion during the year.

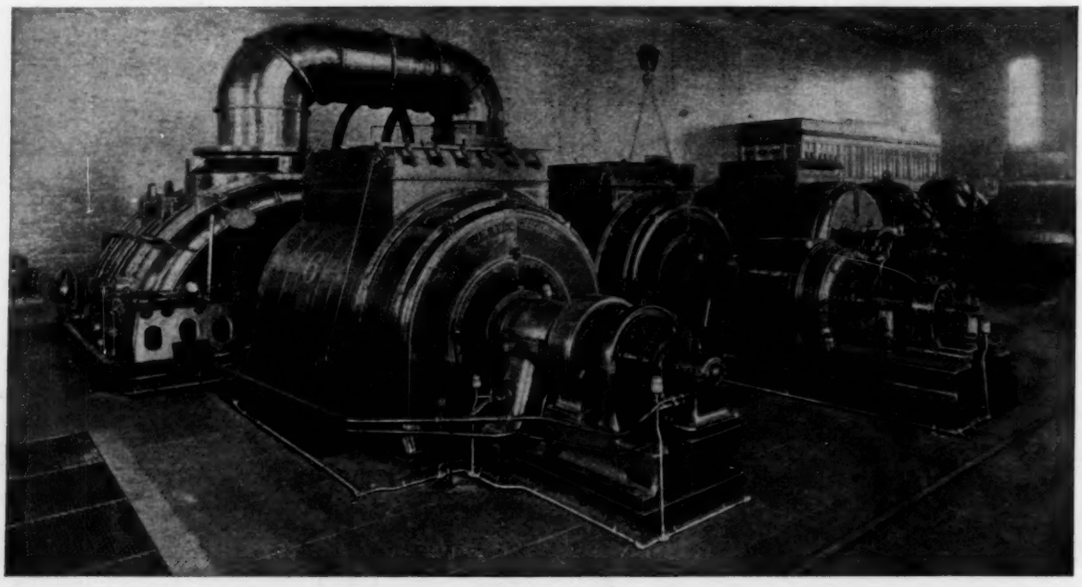


FIG. 1—62,500 Kv-a. Cross Compounded Unit with Auxiliary Generator and Exciters Hell Gate Unit No. 6.

This study was started several years ago by the use of large turbo models. It was not possible, however, to make measurements of the flow in all parts nor could readings be taken with satisfactory accuracy. However, this original set-up provided sufficient data to enable an approximate valuation of co-efficients permitting theoretical and mathematical formulas to be derived.

During the year this pioneer work has been carried forward to a very satisfactory conclusion by the use of small models. Previous calculations and empirical formulas have been checked so that now a complete solution of the complex problem of measuring static pressures in a fluid moving at considerable velocity can be successfully obtained.

With the final solution of this very complicated problem, the company's engineers are placed in an even better position to produce turbo generator equipments with uniformally ventilated parts and greatest economy.

Two other unusual generators each having a capacity of 2350 kv-a, are being built for the United States government to be installed at the McCook Flying Field for the purpose of furnishing power to drive motors used for propeller testing. These machines are unique in that they are to be operated either as 6 or 12-pole generators through a range of speed of 360 to 720 rpm., thus providing a range of frequency of 24 to 72 cycles.

Frequency Changer Sets

The company has under construction the largest frequency changer set ever built. It has a rating of 40,000 kv-a at 300 rpm, 3 phase, 25 and 60 cycles. The design of the 60 cycle end of the machine incorporates an arrangement by which the stator may be shifted by means of a motor driven rotating gear This provision is for the purpose of adjustment of phase position and thereby load adjustment.

The machines are cooled by a closed ventilating system, which includes air washers. Providing for the closed air ducts in conjunction with the rotating frame involves many new problems of design.

The year has witnessed the completion of two 7500 kv-a, single phase, 300 rpm, frequency changer sets equipped with spring mounted stators. By the use of this stator mounting, 80 to 90% of the single phase torque effects can be absorbed, thereby eliminating all objectionable station vibrations.

Synchronous Condensers

The largest synchronous condenser ever built has been placed in operation during the past year, having a rating of 40,000 kv-a, 600 rpm., 11,500 volts, 3 phase, 60 cycles. One of the interesting features of this machine is the fact that its total losses at rated output are only 2% of its kv-a rating. It will be readily recognized that this represents an efficiency for rotating machinery comparing very favorably to that of transformers.

One of the marked advances made in synchronous condenser designs during the past few years has resulted in a general reduction in losses, averaging from 15 to 20%. This is important since, as a condenser produces no revenue, all its losses are a direct charge against the expense of operating the system. They should, therefore, be kept to a minimum.

Coupled with this phenomenal increase in efficiency in the past thirteen years, the maximum rating of synchronous condensers built has grown to twenty times what it was in 1912.

Synchronous Converters

Eight 2000 kilowatt, 600 volt, 60 cycle converters have been built for the City of Detroit for use in four full automatic substations. The two machines

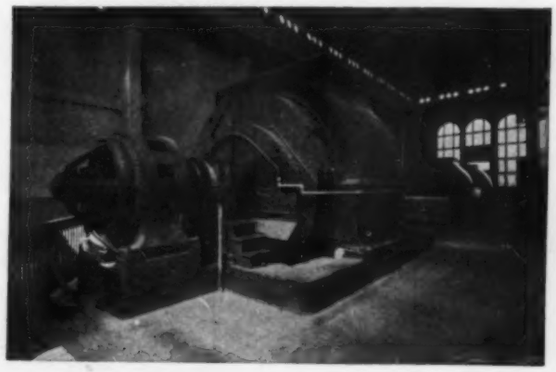


FIG. 3—Westinghouse 40,000 Kv-a. Condenser in Service on the Pacific Coast.

in each substation will be operated from a common bus under a unique system of control devised by the company's engineers.

Thirty-two thousand kilowatts of 600 volt, 25 cycle converter equipment have been built and placed

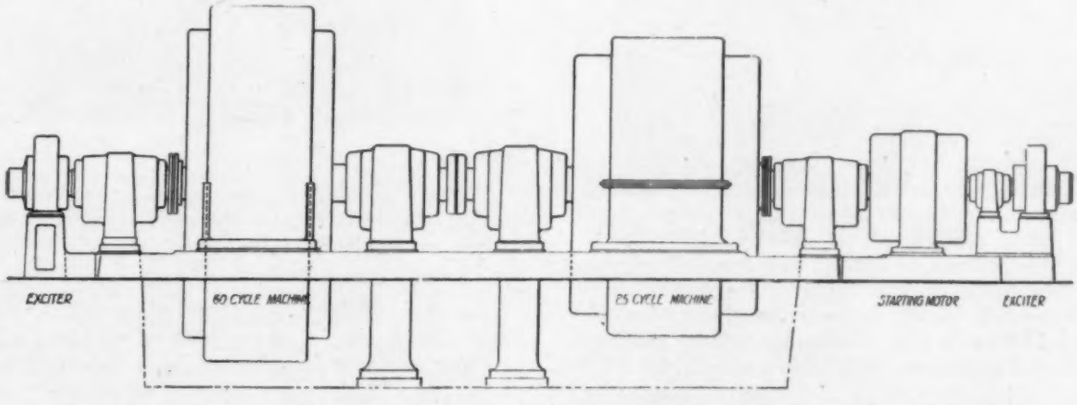


FIG. 2—40,000 Kv-a., 300 Rpm., 3 Phase Frequency Changer Sets, the Largest Ever Built

in operation for the Long Island Railroad for their substation equipment on the new Babylon extension. A portion of this equipment is installed in Westinghouse automatic substations.

Ten 2000 kilowatt, 1500 volt, 50 cycle converter units with automatic switching have been shipped for use on the Imperial Government Railways of Japan.

The electrification of the Staten Island Rapid Transit Company on its Tottenville and South Beach divisions has already been completed, calling for Westinghouse substation equipment consisting of ten 1000 kilowatt, 600 volt, 60 cycle converters, seven of which are operating in full automatic stations and three in semi-automatic stations. Work has recently been started by the Westinghouse Company on the construction of three more duplicate units for the North Shore division of this railroad.

The first converter equipment with step-regulator transformer tap changing provision under load used on Edison 3-wire line system has been one of the achievements of the Westinghouse engineers during the past year. This installation delivered to the Union Electric Light and Power Company of St. Louis consists of two 9000 amperes, 250 volt, 60 cycle converter units now in successful operation with a duplicate equipment to be delivered in the very near future.

The above condenser, together with its pumps, will lose its premier position in the near future to a still larger unit having 80,000 square feet radial flow surface to serve the 80,000 kw. turbine-generator now under construction.

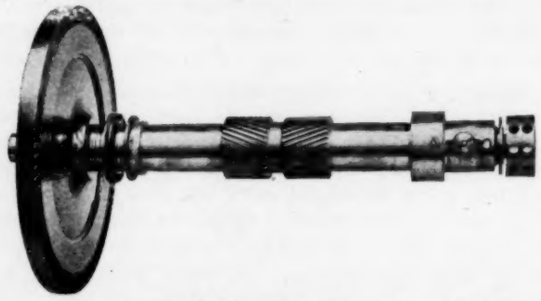


Fig. 5—Rotor for 1000 Kw. Turbine Showing Bladed Disc, Water Seal Gland Runner, Oil Ring, Pinion Teeth, Overspeed Stop Governor and Centrifugal Oil Pumps.

There has been developed a double bank 3-stage air ejector which will show a considerable saving in steam consumption over the 2-stage type now in common use. Each of the two inter-condensers is divided into two sections, through the first of which

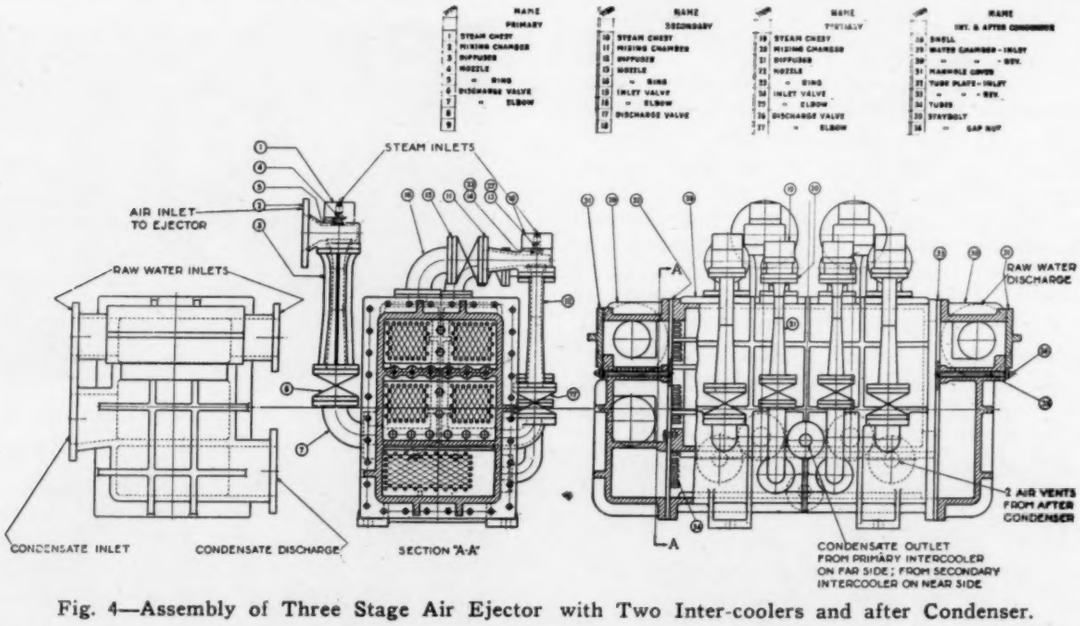

STEAM INLETS
AIR INLET TO EJECTOR
RAW WATER INLETS
RAW WATER DISCHARGE
2 AIR VENTS FROM AFTER CONDENSER
CONDENSATE INLET
CONDENSATE DISCHARGE
SECTION "A-A"
CONDENSATE OUTLET FROM PRIMARY INTERCOOLER ON FAR SIDE; FROM SECONDARY INTERCOOLER ON NEAR SIDE

Fig. 4—Assembly of Three Stage Air Ejector with Two Inter-coolers and after Condenser.

Condensers

A further advance has been made during the past year in condensing practice. The largest condenser yet built containing 70,000 square feet radial flow surface has been completed. It is capable of condensing 500,000 pounds of steam per hour. The circulating water pump has a capacity of 78,000 gallons per minute. With 60 degrees circulating water, a vacuum of 28.9 inches is obtainable, while with 75 degrees circulating water, the vacuum will be 28.3 inches. The total weight of the empty condenser is 631,500 pounds.

is circulated condensate from the main turbine while raw make-up water is circulated through the second section. In the after condenser, condensate from the main condenser is used.

Stokers

A very significant addition to the Westinghouse line of stokers is that of the single-retort stoker. This makes available a highly efficient stoking apparatus for moderate size boilers.

As indicated by its name, the coal is fed to the grates by a single retort located at the center. The coal feeding ram is actuated by a steam cylinder and piston which also impart motion to the grate actuating mechanism.

Steel Mills

The electrification of existing steam driven rolling mills continues at a high rate and several new mills with motor drive have been contracted for during the current year. The increasing appreciation by mill operators of the advantages inherent to adjustable speed drives for certain types of mills is evi-

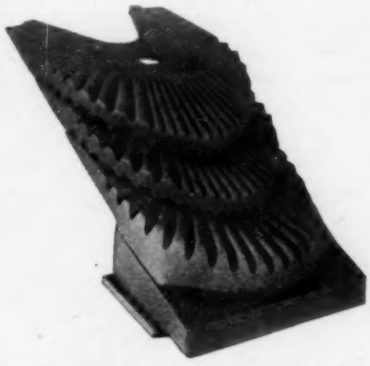


Fig. 6—Button Tuyeres (Improved Design)

denced by the large number of direct current machines for which orders have been placed.

Seven out of a total of 11 reversing equipments ordered this year have been sold by the company, including the drives for four blooming mills, two large structural mills, and a combined universal plate and roughing structural and merchant mill. These total 39,100 hp. continuous rated capacity.

The past year has seen the installation of a drive for a 40″ blooming mill consisting of a 7000 hp., continuous rated, 50 rpm., full field speed, single unit reversing motor, supplied with direct current power from a flywheel motor generator set having two 3,000 kilowatt generators connected in parallel.

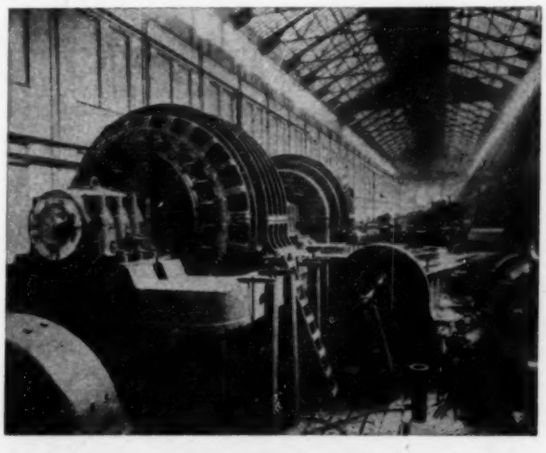


Fig. 7—Test Floor View of Two 7000 Hp., 50 Rpm., Reversing Blooming Mill Motors—the Largest Single Unit Machines Ever Built. Maximum Torque 2,000,000 Pound Feet, Equal to 19,050 Hp. at 50 Rpm.

This 7000 hp. motor is the largest direct current machine yet built in a single frame and has several outstanding advantages over the corresponding double unit machine of the same capacity previously used for mills of this size. This is the first reversing equipment arranged for paralleling the generators. The company has recently developed a system whereby proper division of generator current is assured over a wide range of load conditions.

One of the largest steel plants in the country is dismantling three of its obsolete engine driven structural mills and is replacing these with two modern mills having increased capacity. One of these is for a 44″ blooming mill driven by a 7000

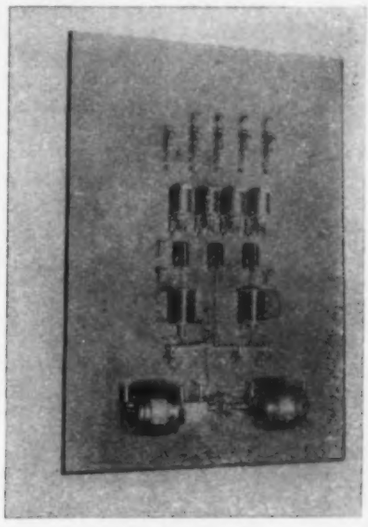


Fig. 8—Panel Board for Speed Matching for Steel Rolling Mills.

hp. reversing motor, complete with flywheel motor generator set, also a 5000 hp. single unit reversing motor for driving a 36″ reversing roughing structural mill, and in addition a 6000 hp., 98 rpm. wound rotor induction motor for a 32″—28″ finishing structural mill.

The equipment for the second mill includes an 8000 hp. 40 to 80 rpm., single unit reversing motor for a 54″ blooming mill, and two 7000 h.p., single unit reversing motors for 52″ universal intermediate structural steel mills. Each of the five reversing

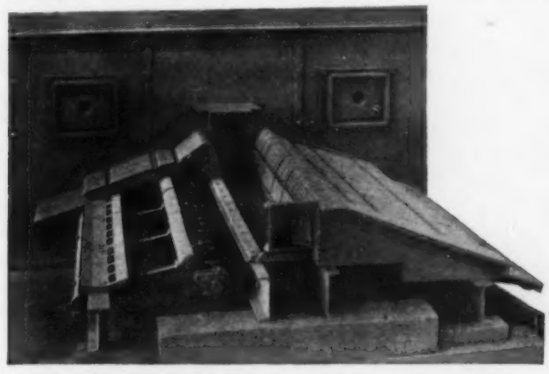


Fig. 9—Single Retort Underfeed Stoker.

equipments will be supplied with power from a flywheel motor generator set having two generators operating in parallel. All circuit breakers are of the safety enclosed truck mounted type.

These steel companies are modernizing their mills rapidly and a number of interesting motor installa-

tions to replace steam engines have been made during the past year.

One of the outstanding examples of rehabilitation is that of one of the oldest steel plants of the country. The improvements consist of the electrification of a 34″ reversing blooming mill wherein a 3500 hp. motor replaces an obsolete steam engine drive; the electrification of a 24″ structural mill and a 22″ bar mill. A second rehabilitation includes the electric equipment to drive a new 35″—28″ structural mill, a combination universal plate structural and merchant mill consisting of a 27″ reversing mill of three stands arranged to roll universal plate on the first stand and to rough down structural blanks on the second and third stands; also five stands of 24″ rolls for finishing of structural and merchant shapes. In addition to the above-mentioned equipment, there is a 3750 hp. wound rotor induction motor installed to replace a steam engine on a 112-inch, three high sheared plate mill.

Speed regulating equipment of the frequency converter type are being installed to change two existing 600 hp., continuous speed induction motors to adjustable speed drives with a speed range of 445,

Fig. 10—Two Speed Stoker Gearbox.

600, 720 rpm. These equipments are to drive the finishing stands of a small merchant and cotton tie mill.

This latter is of a unique design and is a radical departure from current apparatus. It consists of sections composed of parallel strips of small grate blocks, each block providing air admitting surface.

The grate blocks are held in close contact with each other by a compensator which automatically takes care of expansion. They oscillate with an undulating or wave-like motion, the vertical component of this motion keeping the fuel bed in the proper porous condition, while the horizontal component moves the fuel uniformly down the grates towards the dump grates which are power operated. The wide range, over which the stoker engine can operate, makes this equipment suitable for carrying loads of a fluctuating nature.

It is of interest to note that this type of stoker is not only well adapted to small boilers, but also to heating furnaces, having been very successfully applied for the purpose of billet heating in one of the steel plants of the country.

In order to give an increased range in stoker speed, a 2-speed gear box has been developed for the New Model Underfeed Stoker following closly the lines of the company's highly successful single-speed gear box. All bearings in the box are bronze bushed, and with the exception of the power worm and worm wheel, all gears are of high grade, heat-treated steel, and all are arranged to run immersed in oil.

To fulfill the demand for a stoker drive of wide speed range capable of maintaining a constant speed when set at any predetermined point, in spite of

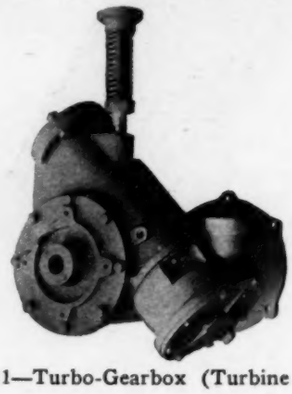


Fig. 11—Turbo-Gearbox (Turbine Unit)

variations in torque, the turbo gear box—essentially a small turbine stoker drive—built integral with a gear box—has been perfected. One turbo gear box per stoker is required, the remaining ones being standard gear boxes. The turbine is totally enclosed, simple in design, compact and dust proof.

In order to obtain better air distribution and better flow of refuse to the dump grates, an improved design of bottom tuyeres has been made for the New Model Underfeed Stoker. With this design the life of castings has been materially increased, and the renewal, if necessary, of such castings, has been materially facilitated.

A new design of ram box has been laid out for both the Old Model and New Model Underfeed

Fig. 12—Front Wall Support (Old Model Underfed Stoker)

Stokers, which permits a renewal of the lining without dismantling the stoker and the throwing away of heavy castings, thus resulting in a great saving both of time and material.

The independent type front wall support used on the company's New Model Underfeed Stoker has proved so successful that it has been modified for use with the Old Model Underfeed Stoker. With

this type of construction, adequate air cooling of the castings is assured, and it is unnecessary to disturb brickwork in making renewals. A special corner tuyere connects the extension side wall tuyeres with the air-distributing box, thus eliminating the very troublesome brick construction problem at the furnace corners. Erosion of the brick work is also

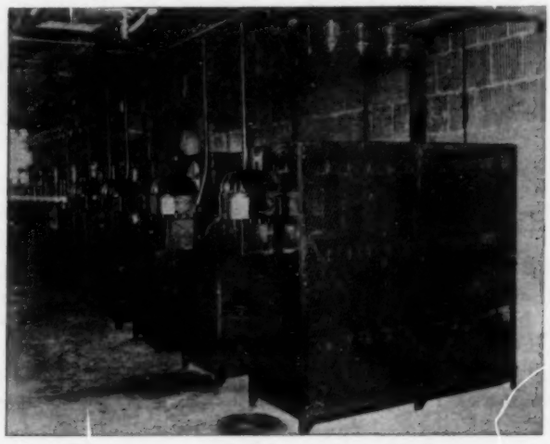


Fig. 13—Part of an 840 Kv-a. Installation of Static Condensers for Steel Plant Power Factor Correction.

prevented by the air jets of the air distributing box directing the gases away from the wall.

Driving equipment is being furnished for a new seamless tube mill being capable of drawing tubes in larger sizes and of better quality than ever before attempted. Diameters up to 14" are contemplated. This entire plant with all auxiliaries will be electrically driven.

Automatically controlled substations in steel mills are coming more and more into popular use. Two companies have placed repeat orders for such equip-

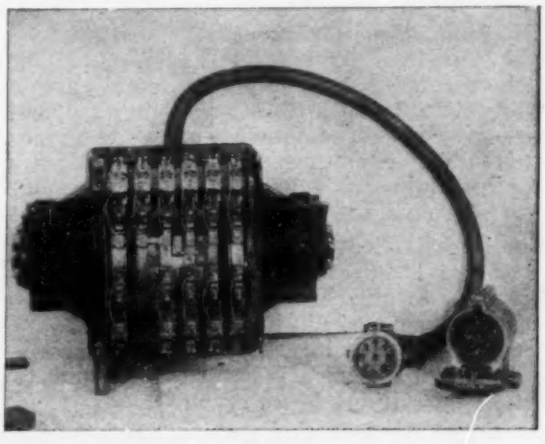


Fig. 14—Foot Operated Master Switch for Control of Reversing Mill Motors.

ment, one of which is for the control of two 1500 kilowatt, synchronous motor generator sets and several feeders.

A static condenser installation of 840 kv-a. has completed a year's successful operation and results show that reductions in the purchased power supply will pay for the installation in slightly more than one and one-half year's operation. A further installation of 500 kv-a is now being made.

A new design of slip regulators has been developed for steel mill service which does away with external electrode cells. A novel feature of the new design is the complete enclosure of the cells so that the possibility of leakage of the electrolyte is eliminated.

A complete line of control for steel mill auxiliaries in crane service has been developed with characteristics as shown in the following table:

Class No.	Form	Reversing or Non-Reversing	Braking
17020	BB	reversing	plugging
17005	MB	non-reversing	none
17010	DD	reversing	dynamic
17030	MD	non-reversing	dynamic
17275	BC	reversing	plugging
17250	EE	reversing	dynamic

The chief value of this development lies in the fact that the line is complete and it is uniform with reference to arrangement, appearance, scheme of

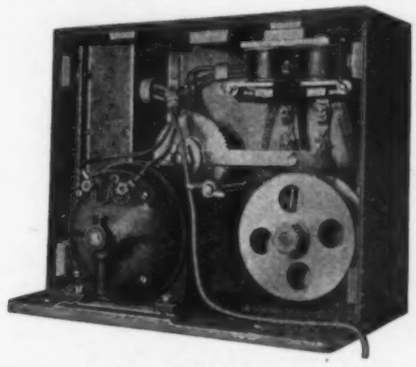


Fig. 15—Automatic Arc Welding Head (Rear View Cover Removed)

connections and the apparatus used. This uniformity has been carried out so that the same panels are used in a very large number of controller assemblies.

Tremendous strides have been made in the control of variable speed, direct current, compound wound motors for steel mill drive for the special applications to tandem rolls for rolling hot steel strips at high speed. This is evidenced by the fact that control of speed is guaranteed for a variation of not more than 2% from "no load" to "full load" at any speed from full field to the maximum weakened field value. This is possible due to the new design of inherent speed regulation so arranged that when once a speed has been set no adjustment of any kind is necessary.

Electric Welding

An automatic arc welding head has been developed and placed on the market, which takes the place of the arc welder's hand and feeds the welding wire to the arc continuously from a reel It will maintain a fifteen volt arc continuously, which is from 5 to 10 volts lower than the best hand welders can maintain. This assures better quality of deposited metal. Due to the method employed of obtaining the feed of the wire, a constant speed motor is used of sufficient power to feed wire in sizes from 1/16 inch to 3/8 inch in diameter. Furthermore, no

change of gears or adjustment of the mechanism is required when the size of the wire is changed because the feeding mechanism and control automatically maintains the proper rate of feed determined entirely by the arc voltage.

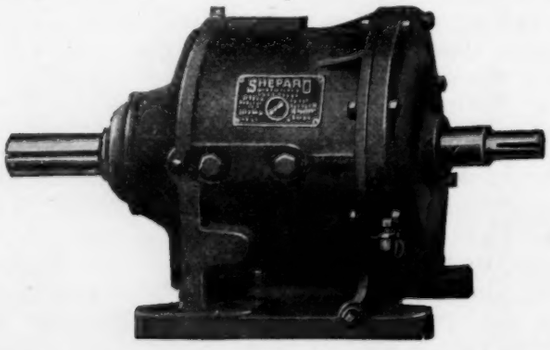
This machine will not "freeze" the electrode to work under any conditions due to the quickness with which the arc is struck and the power developed by the constant speed non-reversing motor. It is by far the most dependable and least complicated automatic welding head yet placed on the market.

A series of exhaustive tests, including fatigue and shock tests, have been made on structural steel pieces to determine the resistance of arc welding to vibratory and impact strains. The results obtained indicate that arc welded joints in structural steel members are so strong that the maximum deformation takes place in the steel members at an appreciable distance from the welded joints. When subjected to vibration of 3520 reversals of stress per minute, the arc-welded joints surpassed standard riveted joints in performance and showed a longer life than the structural steel members themselves. Under a sudden shock produced by a blow of approximately 700 tons, the arc welds in a test piece did not fail even though the structural steel members were severely strained and deformed. Therefore, it is evident that arc-welding is capable of withstanding any stresses that structural steel members will withstand, without deformation.

SHEPARD ELECTRIC CRANE & HOIST CO.

Industry, growing with leaps and bounds as it has in the last few years, has uncovered and proven the necessity for high-speed prime movers. Turbines operating at a high R.P.M. have proven more efficient than the low-speed motor. Likewise, the small, high-speed motor is just as efficient and powerful as the large, low-speed motor and less costly.

With actual experience and proven facts in mind, it is no wonder that industries are eager to adopt the use of the more efficient high speed prime mover. The use of high speed prime movers, however, presents a very difficult problem to the user. It is a problem which involves the harnessing or controlling of the R.P M. of high speed motors, adjusting the R.P.M. to the requirement of the driven machine. Many manufacturers of mechanical equipment developed a device which capitalizes the use of the high speed unit with its economy, and reduces the R.P.M. to a practical range.



The problem of efficient speed reduction has, to some extent, been solved by the use of pulleys and belts, chains and sprockets, rope drives, open gearing, etc. In practically every industry some one of these speed reducing combinations can be found even today. While these methods of speed reduction serve industry with a certain per cent of efficiency, there are objections which in practically every instance cause serious tieups in production. Open gearing, chains and pulleys traveling at high velocities and insufficiently lubricated, as is often the case, wear rapidly. Belts, ropes, etc., deteriorate quickly in plants where dust, dirt, acid, fumes, etc., are prevalent. Then, too, when friction drives are running under load there is a loss in power transmission due to slipping. Most serious of all, however, is the great danger of injury to workmen from rapidly moving, unguarded open gears, sprockets, belt drives, etc.

The Shepard Electric Crane and Hoist Co., Montour Falls, New York, has made great strides during the past few years in the development of an efficient device for reducing the R.P.M. of high speed units. It is a compact, tightly sealed geared reducer, of the planetary type, and known to the industry as a "Speed Reducer." The gears are assembled in a small, compact housing and utilize only a fraction of the space usually necessary for the installation of pinions and gears. These machines are made with single and double gear trains. Single gearing allows ratios ranging from 5.34 to 1; to 15.47 to 1. Double gearing allows ratios ranging from 28.52 to 1; to 82.61 to 1. These "Speed Reducers" are self-contained units and can be coupled easily between a driven unit and a motor of any manufacturer.

The construction details of Shepard Speed Reducers are as follows:

Frame—The frame is so shaped as to support rigidly the moving parts of the reducers, and also forms a complete enclosure of all parts.

The frame consists of one main casting of cylindrical form, flanged with the ends secured to the frame by through bolts. Thus the internal mechanism is completely sealed from the outer air and is flooded with oil. The moving parts are given the most favorable operating conditions and are protected from injury and prevented from causing injury to surrounding objects.

Lubrication—Continuous lubrication of all gears and bearings is effected from one reservoir of such large size as to prevent injury even though the supply of oil is replenished only at long intervals. Only one conspicuous opening requires oil, and this is arranged so that a glance is sufficient to indicate the height of oil within the reservoir.

Gearing—The reduction gearing consists of a single or double train of machine cut spur gears. All gears drive at two points diametrically opposite, thus dividing the work among double the number of gear teeth, which would be in contact by the usual arrangement. The stresses are, therefore, perfectly balanced and there is no pressure imposed upon the shaft bearings. The balanced drive naturally gives a very high efficiency; enclosed and running in oil its efficiency, durability and reliability are not even approximated by any other construction.

All gears and pinions are machine cut from forged or cast steel.

Bearings—All bearings are lined with removable shells, which are generally of hard bronze. The heavy outbored bearings required on some types of speed reducers are not necessary in the Shepard machines.

Accessibility—In the assembly of the speed reducer there are no internal screws, keys or similar parts to give trouble in disassembling. The removal of external bolts releases all internal parts which may then be lifted out with the hands. Replacing the cover secures all parts ready for operation.

THE CUTLER-HAMMER MFG. CO.

Perhaps the most outstanding feature of the past year, so far as the design and application of electrical control apparatus to the steel industry is concerned, has been the widespread installation of the Inductive Time Limit Controller.

This controller, brought out last year, meets the demand for a time limit controller for mill auxiliaries and for crane control, without the use of relays, dashpots or other delicate moving parts and with a very minimum of electrical interlocks. The accelerating time is obtained by means of the inductive principle, using a transformer, which is mounted on the rear of the control panel. The coils of this transformer are connected to the holding out coils of the accelerating contactors in such a manner as to produce the accelerating time desired. The many advantages of this controller include dependability, ease of adjustment, smoothness of operation, maximum results from the motor, simplicity, elimination of dashpot moving parts, interlocks, etc. Mill tables, open hearth charging machines, soaking pit cranes, ladle cranes, standard crane hoists and bucket hoists, screw-downs, and many other mill auxiliary drives have been equipped. Within this year controllers of this type have been also developed for use on crane hoists and have been installed on standard crane hoists as well as on bucket hoists. This widespread use of the inductive controller with complete satisfaction in every case has proved that the controller was a real contribution to the steel industry.

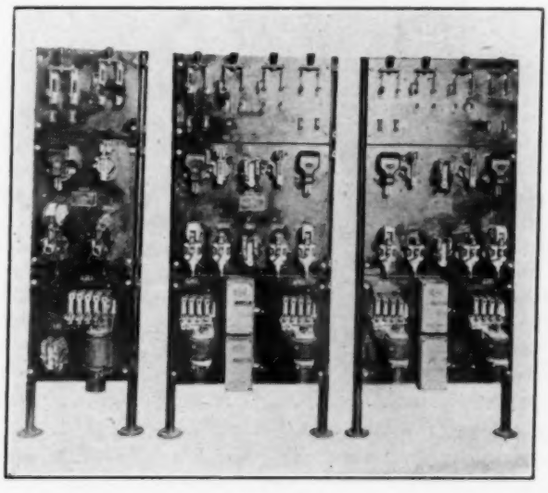


FIG. 1.

New Switchboard Arrangement of Control

In a control equipment, designed for a blooming mill, the panels, instead of being constructed of individual slates for each contactor, were made up of large pieces of slate, mounted on a switchboard type of frame in such a manner that when these panels were mounted side by side none of the framework was visible. Instead of using the unit slate construction, which enabled a single contactor to be removed at any time and replaced by a spare, while the original was being repaired, in this installation the problem of making repairs was approached in another way. A spare panel was provided for each size of motor; that is, there would be one spare for 50 HP., one for 70 HP., etc. Any 50 HP. motor drive can be transferred over to the 50 HP. spare. This is done by throwing over a knife switch mounted on the panel and a small transfer switch which handles the control circuit.

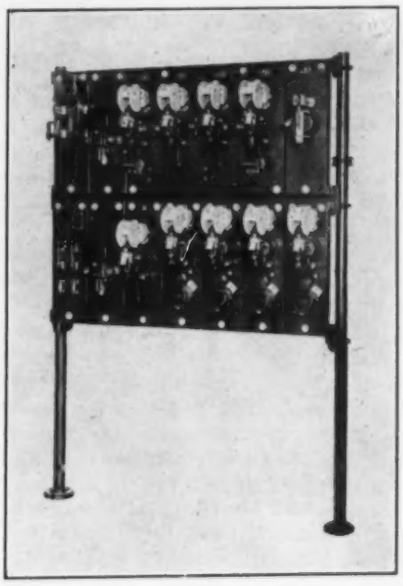


FIG. 2.

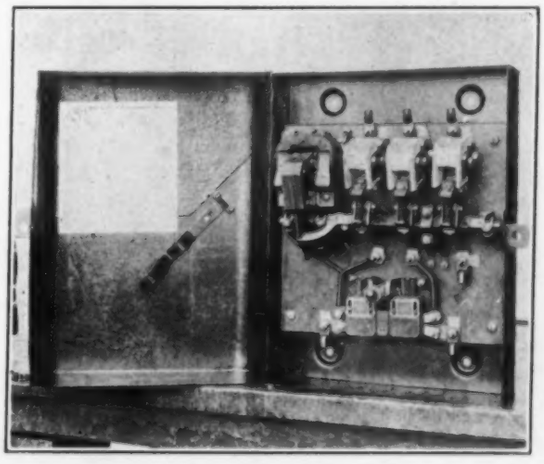


FIG. 3.

The spare panels are arranged to operate with any one of the motors of their particular size, regardless of what the function is of that particular drive. For instance, if drive No. 1 is under the control of limit switches and drive No. 2 is not, it is still possible to transfer either No. 1 or No. 2 over to the spare and get the correct operation on each. In this way, a spare controller may instantly be placed in service on any board which gives trouble and the boards inspected and repaired at leisure. The construction used on this installation completely hides all of the framework of the switchboard and all of the wiring, enabling this wiring to be done in a very simple manner so that the whole installation makes a remarkably fine appearance.

Timing Device for Gas Cleaning

A device has been designed for use in cleaning gas. The device consists of a master timer, which controls a battery of 24 individual timers. Each of these individual timers has control over one cleaning unit. The master timer can operate at a speed which is variable between one revolution in 15 minutes and one revolution per hour. Its operation is such as to start up the unit timers, one after the other, until they have all been started at the end of one cycle. When a unit timer is started, it cuts off the flow of gas and the high tension, which is used to precipitate the dirt, and then starts a hammering device which shakes the dirt out of the cleaning chamber. The hammering device operates for approximately 15 seconds, after which it is shut off and

FIG. 4.

the gas and electricity are turned on again. The timing devices, both master and unit timers, are motor driven and are variable in speed. The valve handling the gas and the switch for the high tension are air operated and the timing devices handle the coils for the air valves.

Steel Wool Making Machines

A controller has been developed for use on a machine making steel wool by scraping wire. This machine has ten 15 HP. motors, which are all operated together from the one controller by means of the variable voltage system of control.

Tandem Mill Control

During the past year newly designed control equipment has been installed in connection with tandem mills for cold rolling nut stock. These mills are similar to those larger size rolling mills, which are operated in a tandem series. The former process of rolling nut stock was somewhat similar to a wire drawing process in that it was necessary to roll the stock through one set of rolls, then wind it on a reel and afterwards roll it through another set of rolls and rewind it on another reel and so on, until the finished product was brought down to the desired section. The new tandem drive eliminates this unnecessary handling of material as the process is

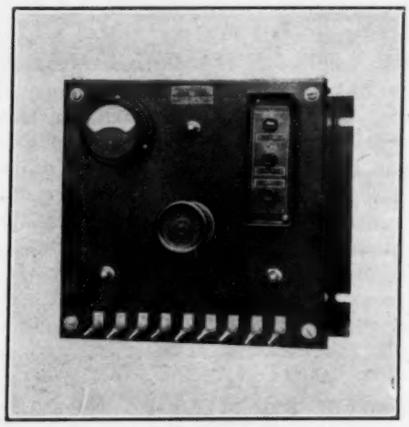


FIG. 5.

continuous and the stock goes from one mill to another and finally onto a motor driven reeling machine, which is also electrically connected in tandem with the five rolls. The mills can be started individually and can be inched together from one station. Pressing any stop button or any overload or voltage failure, which may occur on any of the equipments will stop the entire drive. Further arrangement is provided to allow any combination of the five mills to be used in tandem or any one or more of them to be used individually.

Strip Reel Control

A controller was designed for use on a reel on which strip is wound. This control was arranged automatically to keep the tension constant by cutting down the speed of the reel as the amount of material on the reel increased. The reel was driven through a magnetic clutch, and a second magnetic clutch was provided for braking the reel. Danger of strip breakage was eliminated by having the driving clutch deenergized and the braking clutch energized if the strip failed to come to the reel at proper speed.

A New Development in Across the Line Starters

Of the smaller types of controllers brought out in 1925 are the "X" Starters with thermal overload protection. These starters are for the automatic control of A. C. motors, which are thrown across the line in starting. Because they have inverse time limit overload protection, they make unnecessary the usual over-motoring with the consequent decrease in power factor. In addition to automatic starting and stopping—these starters are used as the primary magnet switch in connection with manual or automatic secondary controllers for slip ring motors.

CONDIT ELECTRICAL MANUFACTURING CORPORATION

The Condit Electrical Manufacturing Corporation has brought out many new developments during 1925, some of which are of such a character as to be considered a distinct advance in the industry.

A few of the new designs of the larger class of oil circuit breakers are the type F-99 and type F-11B. In the industrial line the type N-4 electrically-operated with thermal cutouts has been added. A new line of outdoor switch houses has also been developed. Brief descriptions of some of the new developments are as follows:

Type F-99, triple pole, dual tandem unit oil circuit breaker was developed primarily to meet the ever increasing demands of high-power systems for large rupturing capacity.

The construction of this breaker is of unusual and novel design, as each pole has two distinct copper circuits in separate tanks. These can be arranged to operate in series or in parallel, according to the service requirements.

The laminated contacts of each circuit are protected by auxiliary removable and easily renewable arcing tips with four breaks in series. This provides

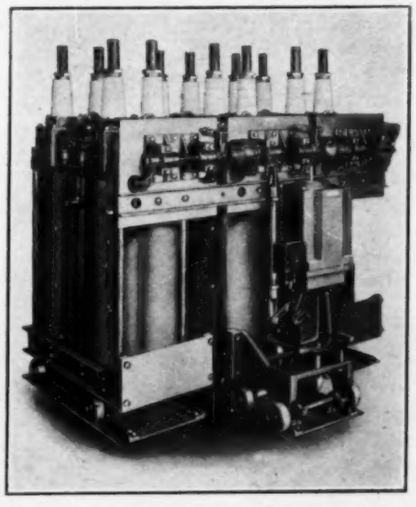


FIG. 1.

eight breaks in series for each pole when the two copper circuits are arranged in series, and provides an extremely high speed of break, of advantage in rupturing heavy short circuits.

The construction of this breaker also involves the principle of energy absorption. An exceptionally heavy and rugged frame construction is used throughout, and double tanks are furnished supported on heavy trucks bolted to the frame by a strong bolt construction with resilient features.

The type F-99 oil circuit breakers are built in single units up to 3000 ampere capacity at 15000 volts with an interrupting capacity of 50,000 amperes at 15,000 volts.

In addition to the types F-11 and F-11A oil circuit breakers a new breaker has been brought out with slightly higher interrupting capacity, but with few changes in overall dimensions.

It has a massive steel frame construction, double tanks affording protection against fire even in case of puncture of inner tank. The inner tanks are resiliently suspended, and designed to withstand the heavy mechanical shocks incident to the interruption of heavy short circuits. The design involves self-

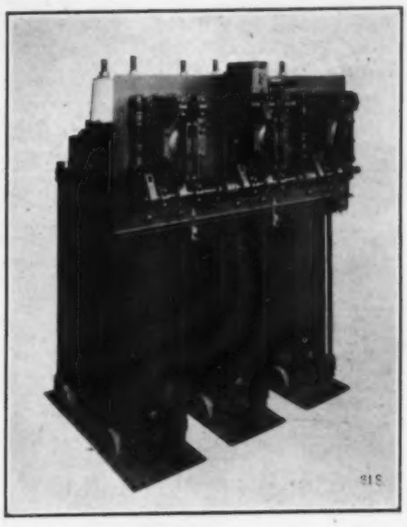


FIG. 2.

contained mufflers and separators, affording relief from sustained internal pressure, and isolate and condense the oil vapors.

Other important characteristics of this breaker are: High speed of operation, substantial current carrying and interrupting members, and ample insulation.

The F-11B oil circuit breakers are built in single units for 600-1200 amperes at 25,000 volts, 1600 amperes at 15,000 volts, single throw, and can be fur-

FIG. 3.

nished for single or multipole operation. Interrupting capacity 6700 amperes at 25,000 volts and 14,000 amperes at 15,000 volts.

Fig. 2. Type F-11B oil circuit breaker.

Type N-4 electrically-operated and equipped with thermal cutouts, is a new switch which has been added to the Industrial line of the Condit Electrical Mfg. Corporation.

This oil motor starter for 600 volts or less with a maximum normal current of 30 amperes is particularly adapted for industrial motor service of 5 HP. or less. The mechanism is of special design, simple in construction, easy to operate and quick make. The entire starter is enclosed in a substantial metal case. It is small, compact, and easy to install. The thermal cutouts provide overload time lag protection for the motor. Undervoltage protection is also afforded.

Fig. 3. Type N-4 push button control oil motor starter.

Switch-houses. The Conduit switch-houses have been designed to provide protection for switching

FIG. 4.

equipment where the power required is too small to justify the erection of a more expensive substation.

These switch-houses may be equipped with practically all types of indoor switching apparatus manually or electrically operated and with or without metering equipment. The house is built of heavy reinforced rust-resisting steel, making a substantial weather-proof structure. Ample ventilation is provided to prevent perspiration and to carry off explosive gases.

They can be furnished with automatic reclosing service operated either by A.C. or D.C. supply. Reclosing service may be of one or more closing cycles with constant or varying time delay, affording minimum interruption to service.

Fig 4. Outdoor switch-house with circuit breaker panel and automatic recloser.

GENERAL ELECTRIC CO.

Main Roll Drives

In the application of electric motors to main roll drives in steel mills, the year 1925 has been one of unprecedented activity. The sale by the General Electric Company alone of 72 motors totaling 141,115 horsepower establishes a year's record which has never before been equaled. These motors may be classified as follows:

	Number	H.P.
A. C. Constant speed—25 cycles	10	29,100
A. C. Constant speed—60 cycles	22	36,450
A. C. Adjustable speed—Kraemer system	2	11,100
A. C. Adjustable speed—Scherbius system	9	24,465*
A. C. Changeable pole—two speed	1	800
D. C. Reversing	4	14,000
D. C. Adjustable speed	24	25,200
Total	72	141,115

*This total H.P. includes the additional horsepower resulting from the application of two double range Scherbius equipments to two induction motors installed some years ago.

This is most convincing proof that electric motors are now recognized throughout the steel industry as the standard for mill drives. Not only has their former competitor, the steam engine, ceased to be a competitor now that the economies and operating advantages obtained by the use of electric drives have become so widely known, but also steam engines on existing mills are being replaced in ever-increasing numbers by modern electrical equipment. A most notable example of this substitution of electric for steam drives is the purchase by the Colorado Fuel and Iron Company, for the electrification of its plant at Minnequa, Colorado, of twelve motors totaling 19,750 h.p. This electrification involved the building of a modern power plant from which two 12,500 kv-a. 6600 volt 60 cycle turbine generators will supply power to the steel plant. Steam for the turbines will be obtained from six blast furnace gas and powdered coal-fired boilers at 300 pounds pressure and 180° superheat.

The Donner Steel Company put in operation a 4000 h.p. reversing motor on its 36″ blooming mill, which was formerly engine-driven. This motor derives its power from a flywheel set consisting of (1) 3000 h.p. 500 r.p.m. 2200 volt induction motor, (1) 78,000 pound steel plate flywheel and (2) 1800 kw. 750 volt direct-current generators, which are operat-

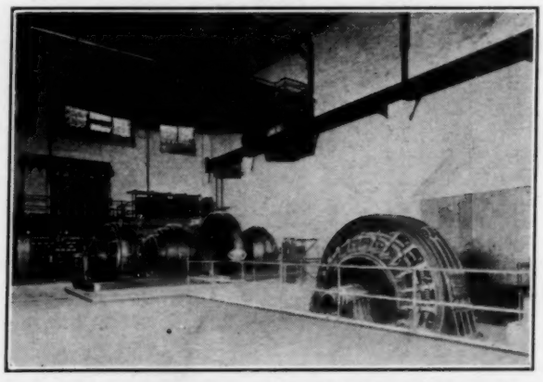


FIG. 1—4,000 horsepower motor driving 36-inch blooming mill at Donner Steel Co., Buffalo, N. Y.

ed in parallel. This scheme of supplying power to a single unit reversing mill motor from two paralleled generators was first suggested by the General Electric Company in March, 1922, and since that time has been rather generally adopted.

An application of especial interest is the motor purchased by the McKinney Steel Company of Cleveland, Ohio, to drive a 10-stand Morgan continuous sheet bar mill. This is a 9000 h.p. unity power factor, 107 r.p.m -6600 volt-25 cycle synchronous motor which, from the standpoint of continuous horsepower

capacity, is the largest motor of any type used for industrial purposes in the United States or, so far as can be learned, in any other country. It is also notable in that it is the first really large synchronous motor to be used for driving a rolling mill. The motor may be started, stopped, or reversed from a master switch exactly the same as any other type of rolling mill motor. The Korndorfer system of control is used and the complete operation of starting on the low voltage tap of the auto transformer, switching to a higher tap, applying field at the correct time, and throwing on the line, is taken care of automatically. In the design of the motor, particular attention has been given to obtaining very good starting torque characteristics. The excitation for the motor field is derived from a separate motor-driven exciter.

The Carnegie Steel Company of Youngstown, Ohio, purchased for installation at its McDonald bar mills (7) 6600 volt 25 cycle induction motors totaling 13,825 h.p. Five of these motors, totaling 8,825 h.p., are provided with double range Scherbius speed regulating sets. It is interesting to note that this makes a total of (15) motors and 28,025 h.p. at this one plant, which are of the adjustable speed type using the Scherbius double range system.

Another interesting Scherbius installation is that being made by the Trumbull Steel Company of Warren, Ohio. The motor is rated 5000/4000/3000 h.p. 450/300/275 r.p.m -2200 volts, and will be used to drive a portion of the 16" hot strip mill. The regulating set consists of a 1175 h.p. synchronous motor, direct connected to two a-c. commutator type regulating machines which are electrically in series with the induction motor rotor winding. This is the first installation of a Scherbius set consisting of two a-c. commutator type machines in series, but this design permits the use of smaller and higher speed units, and the higher regulating voltage obtainable permits of designing the induction motor with a lower secondary current.

The adaptability of the Scherbius system for obtaining speed control of induction motors is further evidenced by the fact that the Bethlehem Steel Company has changed one of its changeable pole two-speed induction motors, purchased a number of years ago, to a 10-pole machine having approximately twice the previous horsepower capacity at synchronous speed. The Scherbius speed regulating set provides speed control both above and below synchronism in a number of steps so that not only the horsepower, but also the flexibility of the drive has been greatly increased.

This company also desired to increase the speed and horsepower of one of its motors which had been in operation for some years. This was made possible by rewinding the motor and by the addition of the Scherbius double range system, speeds above synchronism being obtained up to a maximum of 40% higher than previously available. The available horsepower at top speed was approximately doubled.

The Inland Steel Company purchased for electrification of its 8" continuous mill three 600 volt d-c. motors as follows: (1) 1500 h.p.-50/80 r.p.m., (1) 1800 h.p -200/400 r.p.m. and (1) 800 h.p.-350/750 r.p.m. This company will electrify its 24" bar mill by the installation of a 3000 h.p.-50/150 r.p.m.-750 volt d-c. reversing motor, and has purchased a 2500 h.p-300 r.p.m.-2200 volt induction motor for sheet mill drive.

Electrification at the Steelton Plant of the Bethlehem Steel Company was further extended by the purchase of a 3500 h.p.-50/100 r.p.m.-650 volt d-c. reversing motor to drive the roughing stand of its 35" rail mill. This motor derives its power from a flywheel set consisting of a 4000 h.p.-375 r.p.m.-6600 volt induction motor, (1) 50,000 pound flywheel, and (1) 3000 kw. generator. The 35" rail finishing stands will be driven by a 4000 h.p. 375 r.p.m. induction motor which is an electrical duplicate of that driving the flywheel set.

A new tonnage record for electrically-driven blooming mills was made during the month of March at the Sparrows Point Plant of the Bethlehem Steel Company, when its 40" blooming mill rolled 90,175 tons of ingots.

A repeat order covering electrical equipment duplicating that used on this mill was placed by the

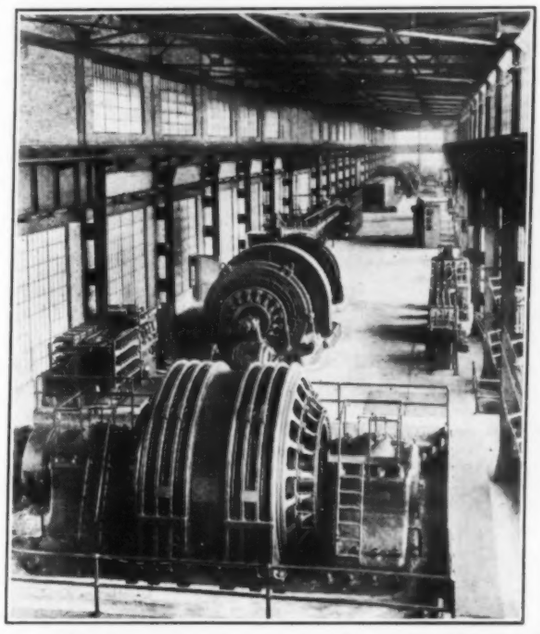


FIG. 2—6,500 horsepower motor driving Bethlehem Steel Company blooming mill at Sparrows Point. A duplicate equipment will be installed on a 46-inch reversing slabbing mill at Sparrows Point.

Bethlehem Steel Company for a 46" reversing slabbing mill, which will also be installed at the Sparrows Point Plant. The reversing motor is a double unit d-c. motor rated 7000 h.p.- 50/100 r.p.m. Power is derived from a flywheel set consisting of a 5000 h.p.-375 r.p.m.-6600 volt induction motor, (1) 50 ton flywheel and (2) 3000 kw. 650 volt direct-current generators.

This company will also put in operation early in 1926 a Morgan 10-stand continuous rod mill, which will be driven by a 4000 h.p.-375 r.p.m.-6600 volt induction motor. This mill and the wire mills for which it will supply the rods are now under construction at the Sparrows Point Plant.

The McKinney Steel Company of Cleveland, Ohio, will install five motors for driving a new 12" merchant mill. The roughing stands will be driven by the largest Scherbius equipment, which has so far been built. The motor is rated 5610/4500/3370

h p.-156/125/93.6 r.p.m.-6600 volts-25 cycles. The finishing stands are driven by adjustable speed d-c. motors, there being (3) 800 h.p.-200/415 r p.m.-600 volt machines and (1) 800 h.p.-240/480 r.p.m.-600 volt motor.

The largest induction motor using the Kraemer system of speed control was purchased during the year by the Youngstown Sheet and Tube Company for a 21" continuous sheet bar and skelp mill, which is to be installed at its Indiana Harbor Plant. The

FIG. 3—New 14-inch mill at Jones & Laughlin Steel Co.

equipment is rated 7500/4040 h.p.-250/134 r.p.m.-2200 volts-60 cycles. Other stands of this mill will be driven by a 3600/1940 h.p.-290/156 r.p.m. induction motor with Kraemer speed regulating set. The last three finishing stands are driven by (3) 2000 h p.-85/165 r.p.m.-600 volt d-c. motors. This will be the first installation in this country of induction motors using the Kraemer system of speed control where the slip energy is not returned to the induction motor through a d-c. machine direct connected to the induction motor shaft. Instead, the equipment has been so designed that the slip energy is made available for driving the finishing motors.

About the first of the year the 14" mill of the Jones and Laughlin Steel Corporation was put in

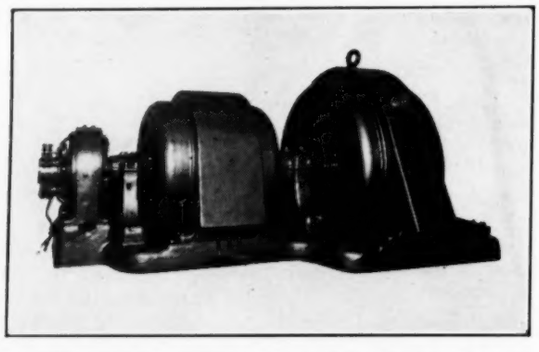


FIG. 4—Frequency converter set for Northup high frequency furnaces, American Brass Company, Waterbury, Conn.

operation. This mill is one of the best examples of the present trend in the development of so-called tandem mills. The stands of this mill are so arranged that the metal is in several of them at the same time. Practically every stand is driven by an individual motor. In order to take care of the wide variety of products, a specially wide speed range of each motor was considered essential. This has been accomplished by driving the mills by means of d-c. motors, which are furnished with power from several synchronous motor-generator sets; the speed range is obtained by a combination of generator voltage and motor field control.

The aggregate capacity of the several motors driving this mill amounts to 15,850 h.p. (on 40°C. rise basis). It will be seen from figure 3 that the electrical apparatus is located in the best possible surroundings; this installation points very definitely to the growing importance which the mill operators are assigning to the electrical part of their equipment.

While the cost of such an elaborate drive is relatively high, the equipment is, on the whole, very economical; the flexibility and the wide speed range

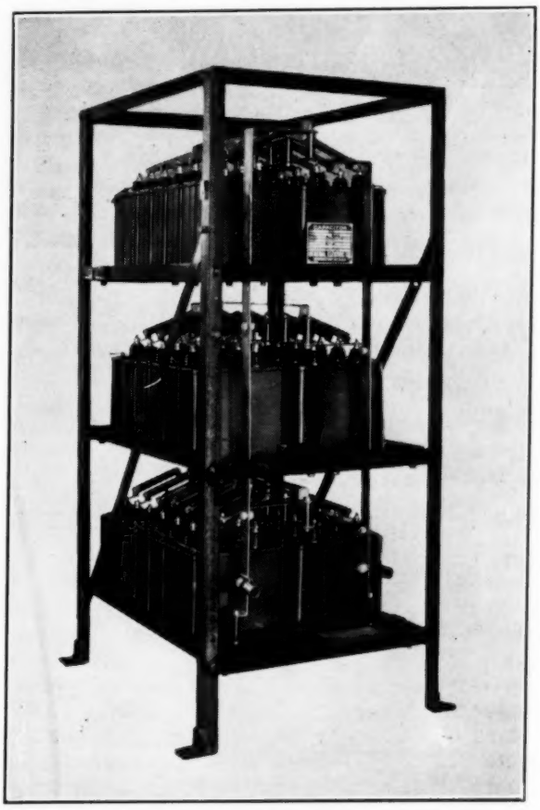


FIG. 5—Capacitor equipment for American Brass furnaces.

permits of rolling on this mill a great variety of products which would otherwise require not less than two separate mills of a less flexible type.

Electrical Heating of Ingot Hot Tops

Early in 1925 there was installed at the plant of the International Nickel Company, Huntington, West Virginia, equipment for heating the tops of ingots, primarily monel metal and nickel. Before using this equipment, 3800 pounds of metal was poured to obtain a 3000 pound ingot, the waste averaging 20% to 30%. Now 3250 pounds of metal is poured and 85% of the ingots are used with very little cropping and a large percentage of the remaining 15% is worked into commercial products.

The electrical equipment consists of one 1800 kv-a. General Electric 3 phase transformer, designed to supply power to the ingot heating equipment and also to serve as a spare for a six-ton arc melting furnace. Other equipment consists of one 10%, 3 phase,

air core reactor for use in the 2200 volt circuit, instrument and control panel, also six automatic, single phase, electrode regulator equipments for controlling the input to the arcs used to heat the top of the ingot.

This equipment has been very successful in operation and full details are given in Mr. Watson's paper, delivered before the Pittsburgh Section of the A. I. and S. E. E., on December 12, 1925.

High Frequency Furnaces

During the week of December 7 several units of the first commercial installation of Northrup Induction. Furnaces operating at 480 cycles were put in operation at the plant of the American Brass Company, Waterbury, Connecticut. While the service in question, melting nickel silver and similar alloys, is of no special interest to the members of the A. I. & S. E. E., these equipments have many possibilities in the heating and melting of ferrous metals and alloys, several applications being under consideration at present and will undoubtedly be demonstrated during 1926.

The initial installation consists of two General Electric motor-generator sets, each delivering 600 kw. single phase, 1875 volts, 480 cycles, to six Northrup high frequency furnaces, each generator being driven by a 3 phase 60 cycle 2300 volt synchronous motor, with direct connected exciter, as shown in Figure 4. To compensate for the low power factor and obtain best circuit conditions, a bank of capacitor units is included with each furnace, shown in Figure 5.

Arc Furnaces

Early in October, the equipment for the first three voltage control of arc melting furnaces was sold, for installation around the first of the year. These equipments are to be used with six ton, three-electrode furnaces, one originally installed with a 1200 kv-a bank of transformers and the two others with a 1500 kv-a bank of transformers.

Each new equipment consists of a 2550 kv-a bank of transformers which will deliver full output at 165, 156 or 147 volts and a lower capacity at 138, 120, 95, 90, 85, 80 or 70 volts. In addition, there were ordered air core reactors of 25% capacity for connection in the 11,500 volt circuit, together with suitable switching equipment.

In operation the melter will have a choice of several voltages to start the heating, probably using 2550 kv-a at 165 or 156 volts, 2400 kv-a at 138 volts for the intermediate voltage and a still lower kv-a at the refining voltage, probably 85 or 90 volts, depending upon the furnace requirements.

By using this equipment it is expected that considerable economies will be effected in furnace operation, especially from the standpoint of the life of the side walls and roof, together with possible reduction in electrode consumption.

In addition to the three equipments referred to above for the Halcomb Steel Company, four similar equipments have been sold, and it is expected that three-voltage operation will become the accepted method of operating arc furnaces taking 2000 kv-a and above.

Turbines

In previous reviews reference has been made to the construction of large turbines designed for operation under steam conditions of 550 lb. gauge at the throttle and 725 deg. F. total steam temperature. There are now five such machines in service, and their operating records have in all cases fully met expectations.

In connection with the installation of two 40,000-kw. machines (Fig. 1) in the Philo Station of the Ohio Power Company, it is interesting to note that when the first unit was installed (September, 1924), it was operated with very satisfactory results without re-heat boilers, these not being placed in service until the second machine was ready for commercial service.

With the completion of the installation, the operation with re-heat has been thoroughly successful and the anticipated economies fully secured. Its service record has demonstrated a fact which had not heretofore been generally realized, viz., that with 550 lb. pressure and re-heat the station economy is practically constant over a wide variation in load.

Early in April, the first of two new similar machines installed at South Bend, Ind., in the Twin Branch Station of the American Gas and Electric Company was successfully placed in commercial service after having been put under steam the day before for the first time. The second machine was put in service later in the year.

Among the large units started in commercial operation during the year was a 60,000 kw. cross-compound machine in the Crawford Avenue Station of the Commonwealth Edison Company. This large unit of an entirely new type (Figs. 2 and 3) was designed, manufactured, erected, and placed in commercial operation within the brief period of 19 months.

A 3000 kw, 3600 r.p.m., 20-stage turbine-generator unit (Fig. 4) for operation at steam pressures from 1000 to 1200-lb. gauge was installed at the Weymouth station of the Edison Electric Illuminating Company of Boston.

Among the large tandem-compound machines were two of 40,000 kw. for the Columbia Power Company, Cincinnati, O., to operate under steam conditions of 550-lb. gauge, 725 deg. F. total temperature, and one inch absolute back pressure. In these machines the steam is re-heated between the high and low pressure elements of the compound unit, Construction was also completed on two 50,000 kw. 62,500 kv-a units for the Richmond Station of the Philadelphia Electric Company. These are of the tandem-compound type with double flow in the low pressure cylinder.

Among the large units under construction were two 60,000 kw. single cylinder turbines for the East River station of the New York Edison Company, and a 77,000 kw. cross-compound machine for the Crawford Avenue station of the Commonwealth Edison Company.

Changes were made in the design of the mercury boiler and turbine in the Dutch Point station of the Hartford Electric Company, and results so far obtained with the new equipment indicate an operating efficiency even higher than that obtained with the original equipment.

Steam and mechanical research work was energetically continued throughout the year, and one of the results of such research has been the extended

use of stainless steel for shaft sleeves in turbines and, to some extent, this material has also been adopted for the production of buckets.

Automatic Stations

Marked advance was achieved in the application of automatic switching equipment, the increase in the size of the units controlled being a noteworthy feature. Efforts were concentrated on perfecting previous designs and increasing the number of standard equipments. As a result there was a considerable increase in the demand for stock equipment.

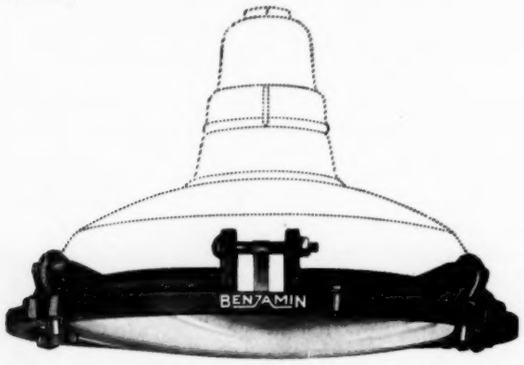
A steel mill equipment was placed in operation by the Youngstown Sheet and Tube Company and consists of two separate partial automatic 275-volt motor-generator sets. This station is started by means of a pull-button control switch, but functions automatically thereafter. The Appalachian Power Company added to its growing list of automatic stations at 275-volt, 300 kw converter equipment at Faraday, Va.

An unusual industrial installation was the two-unit lighting substation in the office building of the McKinney Steel Company at Cleveland, O. The power supply for the mill is at 25 cycles, which is not suitable for office and drafting room illumination. It was therefore decided to install two 100-kw. induction motor-generator sets with automatic control in the basement of the building. Relatively low speed sets are used to minimize the noise.

The automatic control provides for the continuous running of one set and the starting of the second set on load demand. Counter e.m.f. regulating equipment is provided to hold the direct-current voltage within very close limits and the usual automatic protective features are provided. This has proved to be a very satisfactory and economical method of furnishing a direct-current supply to an isolated office building.

BENJAMIN ELECTRIC MFG. COMPANY

The Benjamin Electric Manufacturing Company, Chicago, Ill., has developed a very useful accessory in the form of a dust-type glass cover which is readily attached to most of the Benjamin reflectors already in service. This dust-type cover keeps out the dirt, it is easy to clean, all that is necessary being the wiping off of the smooth outer surface of the glass disc.



Dust-type glass covers are recommended for use in foundries, steel mills, carbon plants, cement mills, railroad shops, coal handling plants, heavy machine shops and wherever dust or smoke fills the air.

It is not always remembered, but it is a fact that no matter how efficient the original lighting installation may have been, invariably the efficiency begins to fall just as soon as a volume of dust and dirt begins to collect on the lamp and on the reflecting surface of the reflector. Here is a case of where you pay for the light and don't get it. Consequently, the dust-type glass cover preserves the original lighting efficiency of installation without materially adding to the upkeep.

These covers can be attached to dome reflector sockets, bowl reflector sockets, symmetrical angle sockets and the type RR fluted bowl reflectors.

The holder is of cast aluminum in two parts. The upper half slips down over the reflector and is held by the beaded edge. The lower half, which is hinged to the upper half, contains the clear glass disc and a circular gasket which seals the reflector from the outside dirt. The hinged cover permits easy change of lamps and the cover is held rigidly in place by sturdy clamps fastened with wing nuts

DUQUESNE LIGHT COMPANY

The last year has witnessed considerable addition to the power generating equipment on the Duquesne Light Company System. The installation of two 30,000 KW turbine generating units in the Colfax Plant has been completed, bringing the present capacity in this station to 180,000 KW. The boiler capacity at the plant has been increased by the addition of five 2860 HP boilers operating on pulverized coal. With the new equipment, greatly improved fuel economies are being secured and the Colfax Station is still maintaining its record as one of the most efficient generating stations in the country.

An interesting development has been the completion of a tie line between the Colfax Plant of the Duquesne Light Company and the Springdale Power Station of the West Penn Power Company. This tie line at the present time operates at 66,000 volts, but will ultimately operate at 132,000 volts between the contemplated high voltage system of the West Penn Power Company and the 66,000 volt system operated by the Duquesne Light Company. The tie line has a capacity of 36,000 KVA and provision is made at the Colfax end of the line for changing the voltage impressed on the line under load so as to control the flow of wattless current. By means of this tie line it is now possible to operate the systems of the West Penn Power Company and the Duquesne Light Company in parallel so as to secure for each of the systems the maximum reserve capacity available on both systems.

Construction work has been started at Colfax preparatory to the installation of two additional 40,000 KW machines, which are expected to go into service in 1927.

The transmission ring of the Duquesne Light Company has been reinforced during the past year by the construction of a twin circuit tower line from Colfax to the new Pine Creek Sub-station, which is located north of the heavy industrial district in the Allegheny Valley. From this new sub-station a number of new 22,000 volt transmission lines radiate into the business district of the City, providing some 60,000 KW of additional capacity available on the 22,000 volt system. Considerable transmission line construction in the Beaver Valley has improved the

service in this district very materially. This has been supplemented by an inter-connection completed between the 22,000 volt system of the Duquesne Light Company and that of the Ohio Power Company at East Liverpool. This connection has been very useful during the past year in improving the continuity of service to both companies in the adjacent territory.

A number of sub-stations have been completed during the year, the largest of which is the new Lawrence Sub-station which embodies the latest designs in combined power lighting and railways sub-stations. Two new complete automatic distribution stations have been completed at Conway and at Morado, two new automatic railway sub-stations at Carrick and Finleyville, while additions have been made at our Grant and Schenley Sub-stations, and a new distribution substation, also automatic, has been started at Woodlawn.

During the past year the Company has further developed and standardized its looped system of transmission service for large industrial customers to the point where the service rendered from such stations is of an extremely high degree of reliability. Through close operation with large industrial consumers, combined rebuilding of sub-stations has been possible at numerous locations, until there are now on the lines of the Duquesne Light Company many of the finest industrial transmission service sub-stations in the country.

The company's service to its customers has been improved during the year through the completion of its new central building, jointly occupied with the Pittsburgh Railways and the Equitable Gas Companies, which has relieved congestion in office space and permitted the business of the Company to be conducted more expeditiously. Included at the new Central Building is a complete new Service Board, at which the functions of the System Operator and the Trouble Board have been combined, so that it has been made possible for our customers to immediately get into direct communication with these operators in any case of trouble.

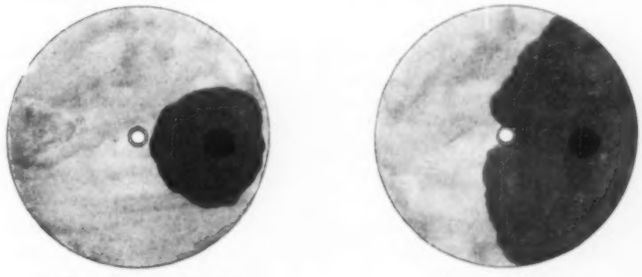
In spite of the business situation during the major part of the year, the steady replacement of steam turbine drive with motors, and the increased number of applications for electric service in steel mills have steadily increased the load on our lines, until at the present time a peak load of approximately 275,000 KW is anticipated for 1926.

KEYSTONE LUBRICATING COMPANY

One of the most important problems with which the electrical engineer has to deal is the lubrication of electric motors. In recent years the introduction of the ball bearing for this type of equipment has, to a large extent, simplified the element of lubrication, but there are in service and will, no doubt, continue to be for a long time to come bearings of the babbitted sleeve type and it is the lubrication of this type of bearing that commands the constant attention of the operating man.

The majority of these motors are equipped with ring type bearings and it is customary to use a fluid lubricant—one that will be carried up from the chamber below the bearing, and spread over the surface of the journal. When oil is used for this service the operating temperatures (varying according to the type of equipment and severity of service) which average 130°F, thin down the oil and greatly increase its tendency to creep. It is common under these conditions to see armature and field windings of motors and generators saturated with oil. This saturation will gradually loosen and destroy the insulation, causing the current to "jump" and result in burned out windings and armatures. On D.C. Motor commutators, oil contamination causes carbonization and short circuiting of the segments. This entails a further loss in production delays.

A large amount of money spent in the maintenance of electric motors, can be saved if a lubricant built to withstand this severe service is used. The Keystone Lubricating Company have for a number of years been marketing a liquid grease of light density, which is admirably suited for the lubrication of electric motors. The graph reproduced herewith shows the relative loss in density between liquid grease and high grade engine oil. Oil of this type is largely used for the purpose of electric motor lubrication:



Keystone Grease — No. 6 Light Engine Oil

Graph shows relative loss of density of liquid grease and engine oil when subjected to temperature of 130°F. In each case the same amount was placed on the hot plate. Note the spread after one-half hour. The oil's tendency to creep increases as the temperature rises. The thermometer was placed on top of the plate in a receptacle in the center.

Some of the leading industrial plants have standardized on liquid grease because their experience has proven that at repair periods they have found no trace of oil on the windings or commutators.

4. Another important feature is that this lubricant will withstand very low cold test—in some instances no trouble has been experienced due to congealing even on exposed motors at 10° below zero. Another phase of this problem is to properly lubricate motors operating under high temperature conditions. The abnormal temperature may be due to constant overload or to motors operating under normal load in departments of plants where steam or electric heat is required in the process of manufacturing. To satisfactorily meet these conditions it is necessary to employ a special lubricant, which will properly function at normal temperatures, but at the same time will retain its density up to the maximum temperatures encountered.

5. The Keyso formula of greases is manufactured for various high temperature conditions. No. 46 density is a liquid and there are semi-solid densities suitable for ball bearing lubrication. It is very important that a ball bearing lubricant should be

free of any bulk-building or deleterious substances which would tend to promote decomposition of the grease or which would have any injurious effect on metal surfaces, and this particularly applies to lubricant used under high temperature conditions.

6. One large manufacturer of transportation equipment recently had occasion to conduct tests of lubricant for ball bearing motors used on their equipment. These motors operated at a maximum speed of 2200 rpm. and the temperature under a running load is 150°F. Motors are mounted in a vertical position. The test included lubricants produced by seven (7) manufacturers. In the case of 6 of the lubricants the maximum running time per application of lubricant was 120 hours. At this point it was necessary to replenish the bearings with lubricant. The seventh lubricant (Keyso 44), which had the capacity to stand up under the severe conditions encountered had run more than 1500 hours on one application at the time this article was written. This test emphasizes the fact that a large portion of maintenance expense can be eliminated if due consideration is given the selection of lubricants to meet the operating condition.

7. Manifold Safety Pressure Lubrication—The field of usefulness of our Safety Lubricator continues to broaden. During the past year installations made on coke pushers and conveyors have further emphasized the wonderful safety features of this method of applying lubricant. On a coke pusher the lubricator is mounted in the operator's cab and 3—1½" header lines are run in different directions and branch lines from the headers connect all of the bearings on the unit. At the beginning of each header line a lever handle stop-cock is placed and the operator opens one at a time and applies pressure by turning the wheel and distribution is obtained by the regulating valve placed at each bearing. After the valve is properly set the adjustment is permanent and no further attention is required.

8. Plant officials familiar with the coke pusher will appreciate the statement that this entire unit may be lubricated by the operator from his cab at any time within 2 or 3 minutes. An increasing number of manufacturers are including the Safety Lubricator in their specifications for new cranes and reports from various plants indicate lubricating costs lower than any system previously used.

9. Lubrication of Herringbone Reduction Gear Sets—Here is another unit where the ability of the lubricant to retain its original density means the difference between maximum life of the gears or early depreciation. It is general practice to use cylinder oils for this purpose—it has been proven in the plant of one of the largest steel companies in the West that more economical operation can be attained through the use of liquid grease. These units consist of 1—1800 HP. Motor—speed 600 rpm.—gear ratio 6 to 1 directly connected to one Herringbone Reduction Gear; face of gear 20"; diameter 7'. Two barrels of grease are required to fill the housing and the consumption is four barrels yearly. The housing is connected to a 2" drain pipe to the outside and submerged in the floor. This pipe is connected to a small receiving tank and every once in a while a little lubricant is drained out. This is used for other purposes of second grade lubrication around the plant.

10. The results from liquid grease are of a high character. They have had gears in service for over 2 years without any indication or perceivable notice of wear. Claim is made that original tool marks are on the teeth of the gears. Some of the units heretofore operated at a very high temperature, because of the insufficiency of the lubricating value of the previous gear shields and gear greases used. A vent pipe is placed on top of the housing and this constantly gave off vapor; since the introduction of liquid grease there has been no indication of heating nor any vapor arising from the pipe.

V. V. FITTINGS COMPANY

The V. V. Fittings Company during the year past developed many practical fittings and devices that have proven of great value to the electrical industry and created increased interest in their products. Among the many new developments, a few of the most important ones are here briefly described and illustrated:

FIG. 1. AP—Pull View

FIG. 2. AP—Splice View

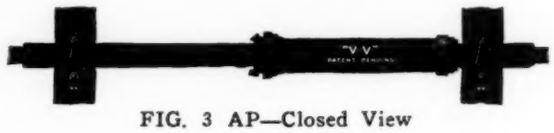


FIG. 3 AP—Closed View

The AP Pull and Splice Fitting recently marketed is designed to give an easy pull and splice in the open for either horizontal or high vertical pulls. The illustrations clearly show manner of application. It permits an "Open Gap in the conduit variable from one to nine feet, as may be desired. It is neat and symmetrical in appearance, absolutely water and vapor tight, made of

FIG. 4.

FIG. 5.

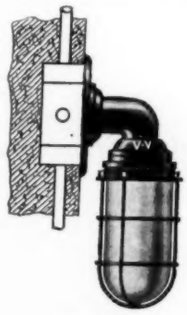


FIG. 6.

cast iron in sizes ranging from 1" to 6" inclusive, of black or galvanized finishes. Each outfit consists of an End Connecting Terminal with internal bushing (into which the "Sliding Sleeve" screws), a Stuffing Box Fitting complete with Gland and

Packing (which fastens to one end of the Sliding Sleeve) and a Special Bushing for the end of the main line conduit.

Adapter Plates for Octagon, Round and Square outlet boxes of 3¼" and 4" standard makes, permitting the attachment of V. V. vapor-proof fixtures, snap switches, fixture ball and socket hangers, weather-proof receptacle covers, etc., etc., now make it possible and convenient when using outlet

FIG. 7.

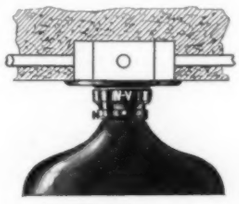


FIG. 8.

boxes to add these attachments. The followning illustrations show the adaptation of the adapter plates and fittings:

The Type PH vapor-proof portable hand lamps are made for 60 watt Mazda B lamps, 75 watt Mazda C lamps, or any lamp not exceeding 2¾" x 6⅛". These hand portable lamps are made in brass or aluminum, sturdy of construction and for long or severe service. The handle is provided

FIG. 9.

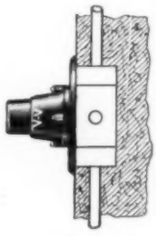


FIG. 10.

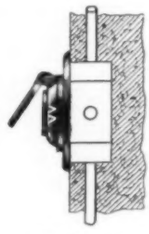


FIG. 11.

with a brass stuffing box and conical-shaped rubber bushing, which serves as a strain relief and seals the cable entrance. The guard is arranged with a hook; the glass globe screws into the cap, which is rubber gasketed.

A newly developed weather and rust resisting drop lid cover for all V. V. standard No. 2 size Type 5 series fittings is among the added features of the V. V. line.

FIG. 12.

FIG. 13.

The Types EXA and EXC are new. By the use of these extension fittings it is made easy for the running of extra circuits from old outlets without the need of changing the fitting already installed. The hubs are raised sufficiently to allow a return circuit over the pipe already installed, a unique feature, readily appreciated by all having work of this character to do. The EXA and EXC are made for ½" conduit size and for mounting on all No. 2 size Type 5 series round base V. V. fittings.

The RM series are a newly developed line of heavy cast iron boxes with detachable hubs for ½", ¾" and 1" conduit sizes, made in one, two and three gang types. They are equipped and made for V. V. standard heavy duty 2 pole, 30 amp. and 60 amp., 250 volt slate base receptacles and V. V. Type R plugs. Snap drop lids over the opening assures against dust and water entering receptacle when the plug is removed.

The RH series, also newly developed, are designed along similar lines, as the RM series, except in that they have an apartment in which are mounted the two pole, 30 amp. or 60 amp., 250

FIG. 14-EXA.

FIG. 15-EXC

FIG. 16-RM.

volt porcelain cutouts. All lids are of snap drop design. These boxes have detachable hubs for ½", ¾" and 1" conduit sizes and are made in one, two and three gang types, furnished with V. V. standard heavy duty two pole, 30 amp. or 60 amp. 250 volt slate base receptacles, and V. V. Type R plugs. These fittings are adaptable for use where

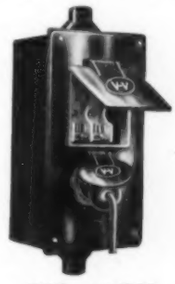


FIG. 17-RH

one or more plug outlets are required and where protection against dust, dirt, lint and moisture is desired.

The SA series Shock Absorbers for flexible fixtures are designed and constructed to eliminate excessive vibration and undue shocks, thus prolonging the life of lamps and fixtures. Self-aligning, internal parts "keyed" to prevent turning. Ideal for use on crane runways, elevated railways, mine breakers, locomotives, industrial plants, fac-

FIG. 18-SA.

FIG. 19-BSJ.

FIG. 20-SS.

tories, etc. They have a 22 degree swing in any direction and always hang plumb.

The BSJ series flexible fixture hangers are made for use where the absence of shocks and vibrations does not make necessary a shock absorbing

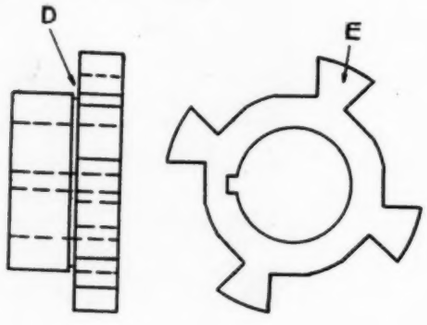
hanger. The hangers permit a 22 degree swing in any direction, always hang plumb and the movable ball is provided with lugs which travel in internal keyways, preventing any possible twist or turn of the fixture, thereby assuring protection to the wiring. They are neat in design, of exceedingly strong construction and will sustain fixtures of considerable weight.

The recently developed SS series give both a dust-proof and weather-proof installation. They consist of heavy cast iron boxes with detachable hubs of ½", ¾" and 1" conduit sizes. Furnished with single pole, two pole or three pole snap switches of 10 amp., 20 amp. and 30 amp. ratings for either 250 volt or 600 volt. The indicating dials are made of brass, the operation of the switch being both easy and positive. A ratchet with spring tension under the indicating dial insures correct movement of the switch and the indicating arrow points to the correct registration of the "ON" and "OFF" positions. By use of rubber gaskets for the cover and hub plates, these switches will give an absolute weather-proof installation.

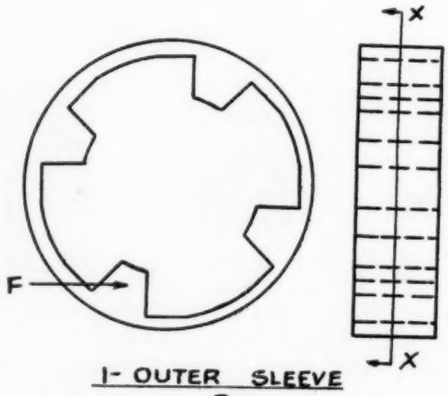
THE CLARK CONTROLLER COMPANY

A flexible coupling of extremely simple design has been placed on the market by The Clark Controller Co., of Cleveland, Ohio.

This coupling comprises two duplicate flanges as per Fig. A, one outer sleeve, Fig. B, and eight pieces of resilient material such as standard hydraulic packing, see Fig. C.



2- HALF COUPLINGS
A



1- OUTER SLEEVE
B

The assembled cross sectional view, Fig. D, shows how the extended lugs, "E," on one-half drive through the hydraulic packing, "C," to the extended lugs, "F," on the sleeve and then again through the other pieces of packing to the lugs, "E," on the other half. The lugs, "F," on the sleeve extend all the way across the lugs, "E," on both halves, so the packing is entirely in compression.

A simple spring steel or phosphor bronze retaining ring at each end of the outer sleeve holds the sleeve and packing in place.

In a motor-driven application, if it is necessary to change armatures, all that has to be done is to

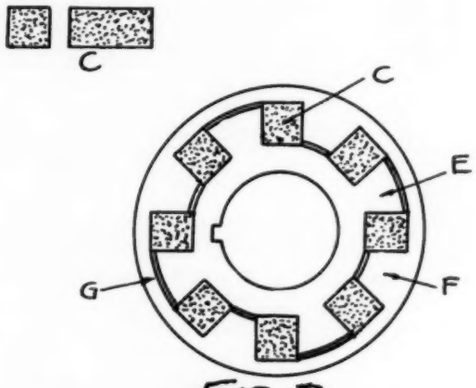


FIG. D
ASSEMBLED VIEW
THRU X-X

remove the retaining rings, slide the sleeve back over one of the halves or flanges, lift the packing out and the armature with its half of coupling can be lifted out.

When assembled there are no bolts nor projections of any kind, so a safety guard is unnecessary. The coupling is adaptable to reversing as well as non-reversing drives and allows a large margin of angular and vertical misalignment and also permits end float.

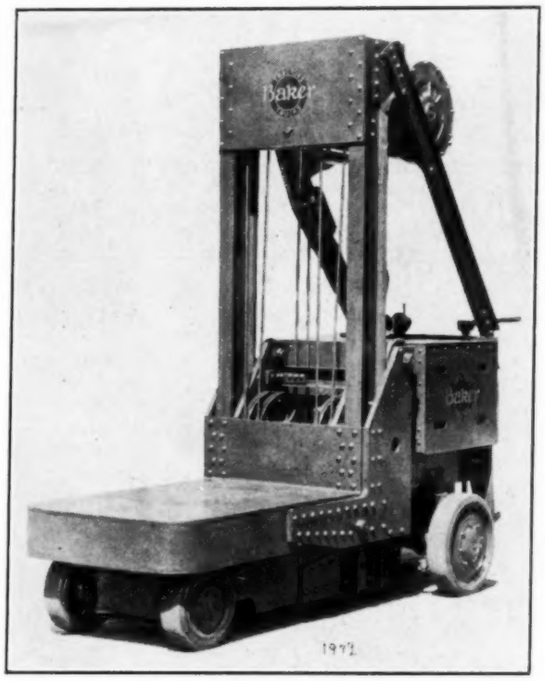
Several couplings of this type varying in size from ten to six hundred horsepower have been in successful operation for several months on heavy service steel mill drives.

BAKER-RAULANG CO.

The accompanying photograph shows the new Baker 6-ton Hy-Lift Truck, being marketed by the Baker-Raulang Company, Cleveland, O. For several years the steel stamping and automotive industries have recognized the Hy-Lift type of industrial truck as the most practical machine for changing dies conveniently and at low cost. But every year dies have been getting heavier and heavier until some of the large cowl and fender dies have reached six or seven tons.

Naturally, these enormous loads have proven rather destructive to trucks built to carry two or three ton loads, but this 6-ton machine has been designed with the necessary strength and ruggedness for this work.

The main frame consists of two 8-inch and two 9-inch channels tied together by a 1-inch gusset plate. The roller frame is fabricated from four 1-inch plates and the 5/8-inch steel platform is carried by four 8-inch channels. The vertical track on which the roller carriage runs consists of two 8-inch nickel-steel I-beams. The power plant employs a Baker totally enclosed series motor driving through a worm reduction and full floating axle shafts. The driving axle is connected to the frame by means of the patented duplex compensating suspension, which relieves all axle strains and maintains accurate



alignment between the axle and truck frame under all road conditions. The hoist is of the 2-cable type and the drums are driven by a compound wound motor through a combination worm and planetary reduction.

When dies are changed by the hy-lift truck method they are conveniently stored on roller racks three or four tiers high and quickly transferred to and from the truck platform. The very heavy dies should be stored on the floor on skids or on blocks so that the hy-lift can run underneath the dies and pick them up.

THE CROUSE-HINDS COMPANY

During the year 1925 the Crouse-Hinds Company has placed on the market many new types of Condulets, which have proven to be of great value towards better electric wiring equipment. Notable among these developments and interesting to the Steel Industry has been the new lines of Arktite plugs and receptacles. This series of plugs and receptacles are made in two, three and four-pole designs with capacities from 10 to 200 amperes and circuits up to 600 volts AC or DC. Plugs and receptacles are made in watertight and non-watertight types and plugs are also made for all types of cables. Suitable Condulets have been made so that the Arktite receptacles can be easily mounted.

The interiors of both plugs and receptacles are so designed that they are very easy to wire, and when assembled in their respective housings, they are thoroughly protected against mechanical injury. All plugs and receptacles are polarized so that the plug cannot be inserted except in one position. The plug contacts enter for some distance into the insulating material of the receptacle and the design is such that, when the arc occurs, the gas formed automatically extinguishes the arc before the plug contacts leave the receptacle insulation. It is from this the plug derives its name, Arktite.

A very important safety feature has also been incorporated in the Arktite line; namely, the plug and receptacle are so constructed that the wires or flexible conduit can be effectually grounded, thus protecting workmen from electrical shock should the insulation on the wires break down.

The MKS series of interlocking switches and plugs bring forth another valuable addition tending towards electrical advancement. These MKS switches are made in 30 to 200-ampere capacities for 250-volt AC and DC and 500-volt AC service, and in 2 and 3-pole designs. Construction is such that it is both impossible to withdraw the plug or open the door of the fuse compartment unless the switch is open, or to close the switch unless the plug is fully inserted and the door of the fuse compartment is closed. The switches are of a rugged design and are enclosed in cast iron Condulets.

Condulets of the FA series with our tumbler switches are for use in industrial plants or wherever such switches would be subjected to severe conditions. This series is manufactured both with hubs cast solid with the body and with openings taking the conduit hub plates; it is made in single, two, three, and four-gang. The watertight cover, especially adapted for out-of-door use, is provided with a handle for externally operating the switch, and the non-watertight cover is provided with a rim to protect the self-indicating switch handle which projects through a slot in the cover.

The outstanding feature of our safety hand lamps is the cord clamp placed on the extension cord so that any strain brought on the cord will be transmitted to the cord clamp which rests against the shoulder in the handle; this elimnates all possibilities of the wires being pulled from the lamp receptacle.

The complete construction of these hand lamps is such as to insure good service and simple compatibility. The handle is of well seasoned maple with Duco-finish and the guard and half shade are made of a special cast aluminum alloy. The wing nut at the top of the shade holds all parts securely locked together when engaged; a few turns of this wing nut gives free access to the lamp.

The demand for means to facilitate increased production has lead to more extensive research in the development of the Crouse-Hinds floodlights, which in turn has brought forth a floodlighting product particularly adapted for use in factory yards, and all places of industry where night lighting is required.

The Safety Hand Lamps, the Arktite Plugs and Receptacles, the Interlocking Switches and Plugs, the FA Series, and the new Floodlights are all rewards of the endeavor of our company to couple all devices with safety.

ADVERTISING PAGES REMOVED

ANNOUNCEMENT

IRON AND STEEL EXPOSITION

Fuel Electricity Safety Machinery

The twenty-second annual convention and Iron and Steel Exposition will be held at the Hotel Sherman, Chicago, Ill., on June 7th, 8th, 9th and 10th, 1926.

No space for sale as all booths will be awarded first to the exhibitors who have had displays at our previous Iron and Steel Expositions. Floor plans will be mailed February 1st, 1926.

IRON AND STEEL EXPOSITION

706 Empire Building,

Pittsburgh, Pa.